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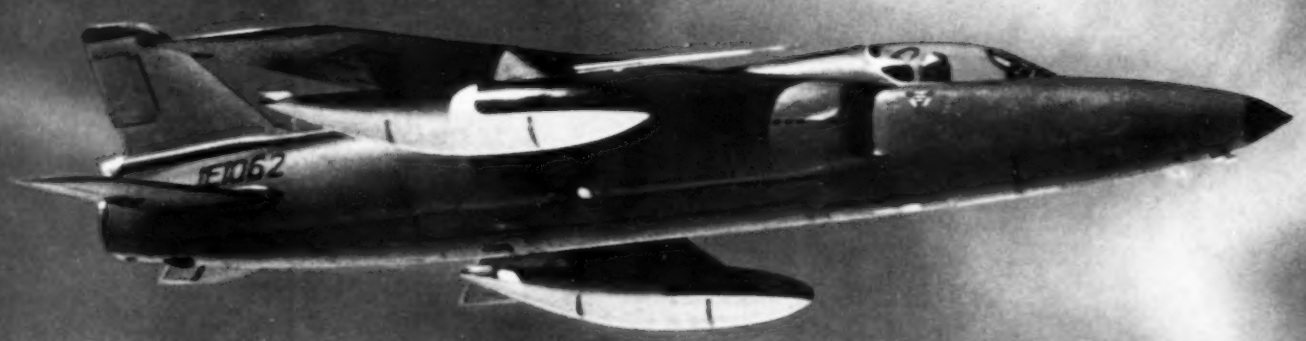

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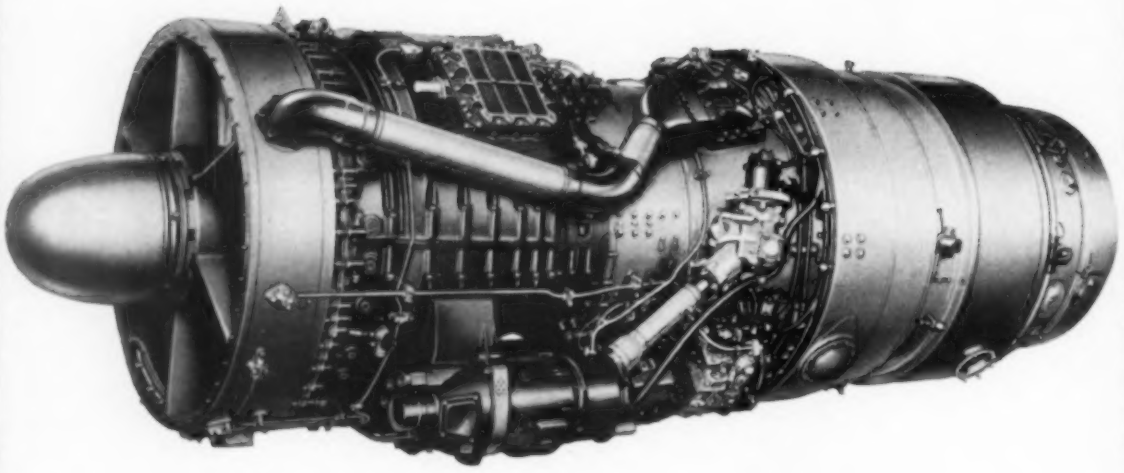

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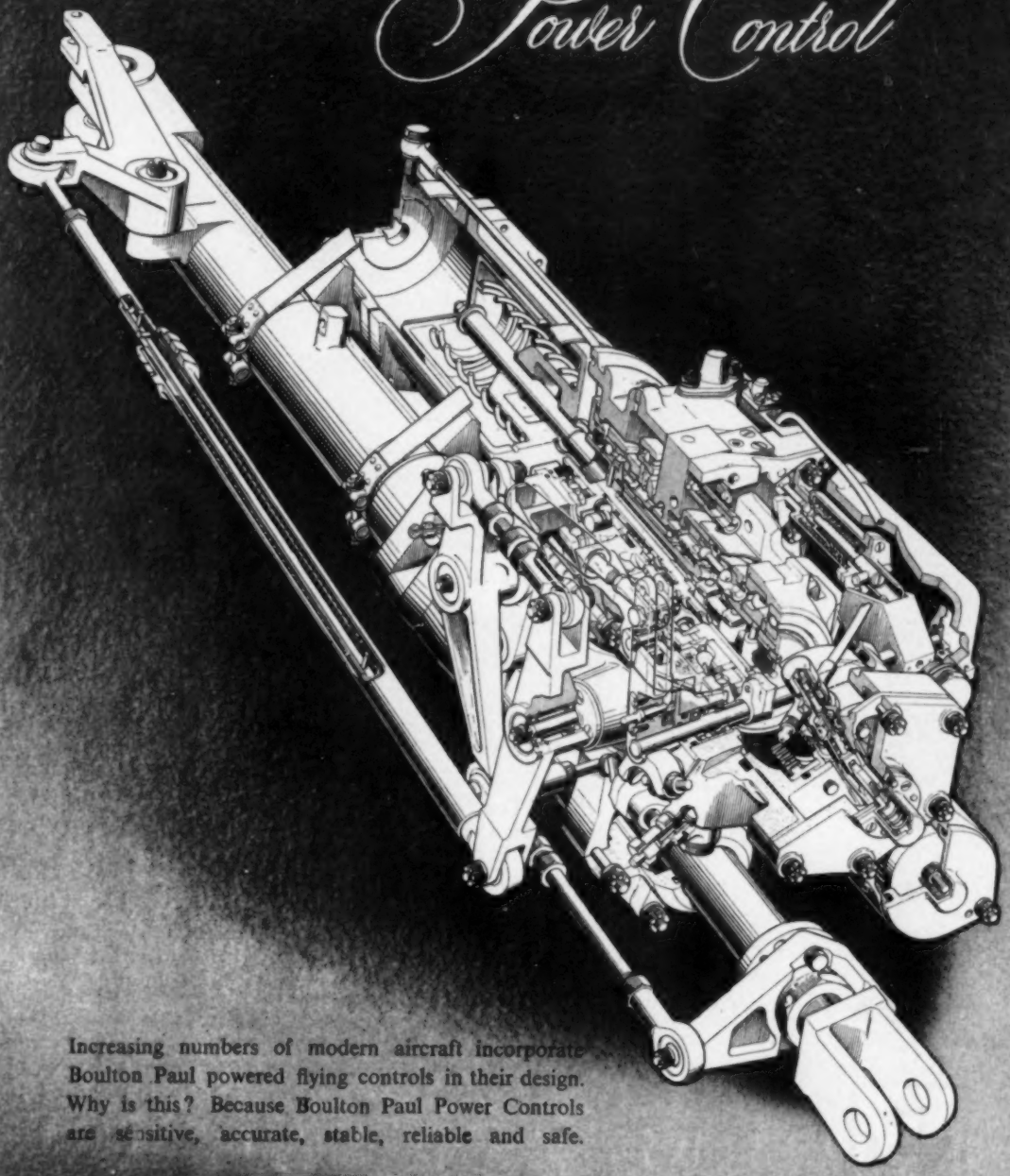

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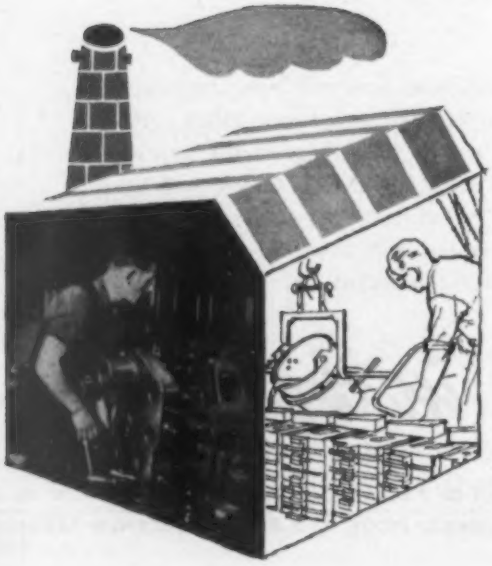

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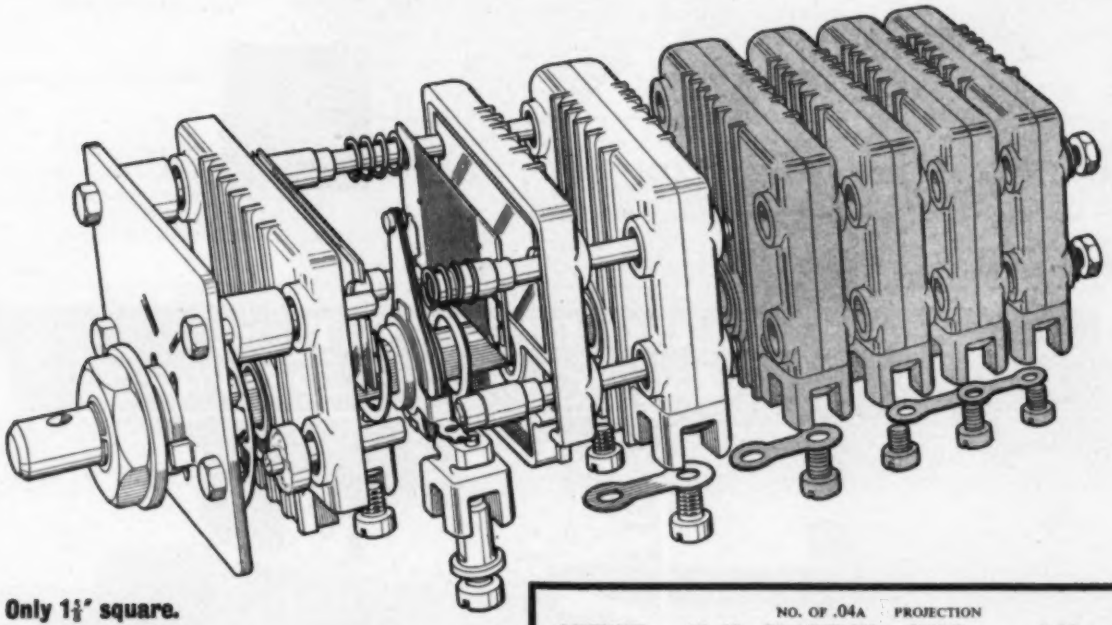

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150	1	6 — 10	1.175	80/10/0940
100	1	11 — 16	1.175	80/10/0941
75	2	17 — 23	1.575	80/10/0926
50	2	24 — 31	1.575	80/10/0935
33	3	32 — 50	2.075	80/10/0942
2 × 600	2	2 × 2	1.575	80/10/0949
2 × 300	2	2 × 3 — 5	1.575	80/10/0947
2 × 150	2	2 × 6 — 10	1.575	80/10/0936
2 × 100	2	2 × 11 — 16	1.575	80/10/0937
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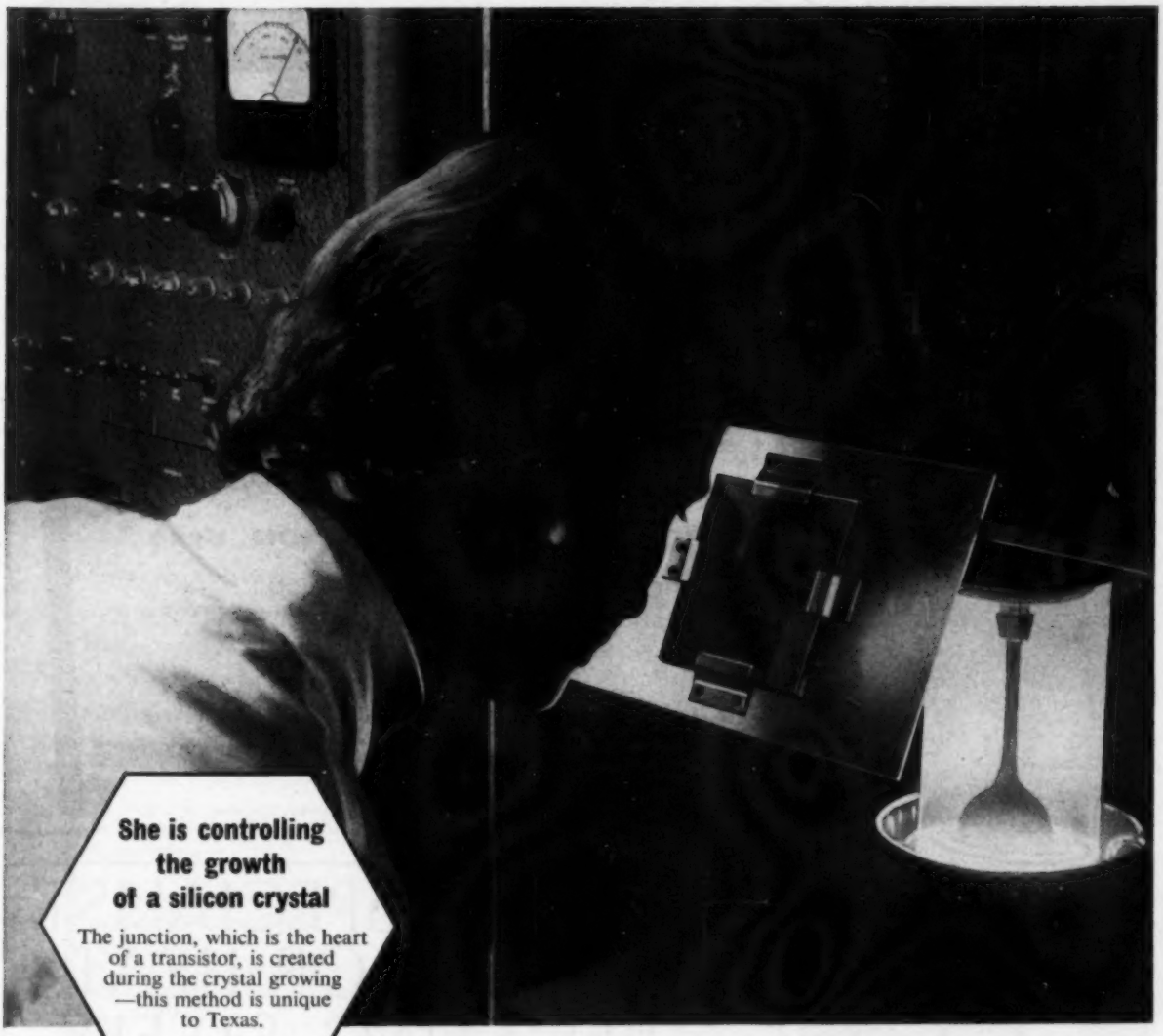

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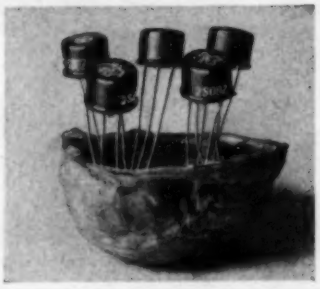

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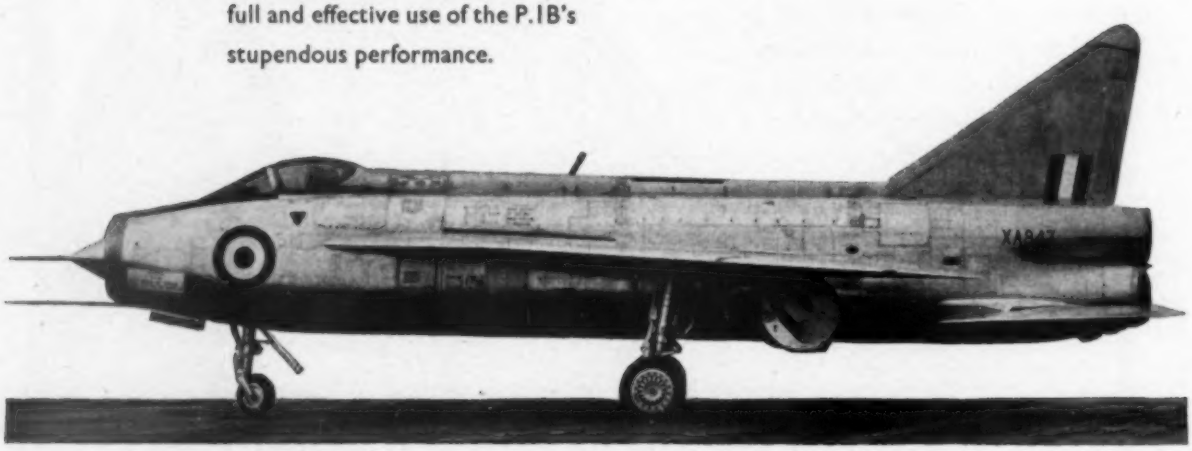

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FIRST AERONAUTICAL WEEKLY IN THE WORLD FOUNDED 1909

FLIGHT
and
AIRCRAFT ENGINEER

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Towards the Supersonic Transport

WE reported last week on British progress in the supersonic-transport field. Briefly, this amounts to the fact that individual firms are working with the Royal Aircraft Establishment to find an *economic* solution, though a decision to go ahead is not expected for 12 or 18 months.

The very mention of supersonic transports sends a shudder through most of the world's airlines; the financing of current re-equipment is quite enough to be going on with. But no one doubts that supersonic commercial aviation is inevitable.

Flight reported as long ago as January 1957 that Lockheed were working on a Mach 2.7 project which, according to the company's senior vice-president, Mr. Hall Hibbard, could be flying by 1963. At the same time we recorded the rival Douglas point of view on supersonic transportation—which was that it would not be practicable for 15 or 20 years.

Lockheed have since referred frequently to their plans. About two months ago Mr. Kelly Johnson of that company said that prototypes could be in the air in 1963 or 1964, and in service two years later. He added: "There is no sense in being a *little* bit supersonic; let's go." He revealed one or two hard facts. For example, the Lockheed project would be "long and sharp," would weigh 450,000 lb, cruise at Mach 3 at 80,000ft and have a range (undefined) of 3,500 miles. Wing loading would be "relatively low"—40/50 lb/sq ft. Powerplant was not mentioned.

More recently Mr. Hall Hibbard was even more optimistic: he said that Lockheed could start work on their project in 1959, and could have a prototype flying by 1962. He said that airfield requirements would be less than those needed for subsonic jets "because the supersonic transport would have enormous power and a surprisingly large wing." He referred to the "pleasant mistake" made in overestimating the supersonic drag of the F-104 and the X-7 test vehicle.

What of Douglas's plans? Do they still regard supersonic transport as 15 or 20 years away? Apparently not; *Aviation Week* reports that they are "well along" with a Mach 2 supersonic transport project, and that "it seems reasonable to expect Douglas to be ready to fly it in about two years."

No one can say what Soviet designers are planning, but there has been one isolated report—from an Aeroflot source—that the Russians will have a supersonic transport flying within two years. If this happens (and on the past form of Soviet forecasts it may well do so) America's supersonic airliner efforts will be Sputniked.

In the light of these foreign plans and prophecies Great Britain has a difficult decision to make. A British supersonic transport is a speculative investment anyway: it will be even more so if a decision to go ahead is delayed for another year or more.

Olympian Gliding

DURING the next fortnight, over the plains of Poland, an Army colonel, two Naval commanders and a company chairman will be upholding the prestige of British gliding in the world championships. For all that their practice has had to be done in spare time snatched from commercial or Service commitments, these men are tough and experienced gladiators in the silent arena which birds know by instinct but man has painfully had to discover; and no doubt the Olympia and Skylarks from Newbury and Kirbymoorside will give good accounts of themselves (in such capable hands) when competing with more exotic mounts.

With Russian participation—for the first time—and with Poland's diamond-badge-studded team (which has been training hard for the past five months) striving to win the championships for which she is host, competition will be keener than ever before in this year's Olympics of the gliding world. We wish the British team well, feeling confident they will indeed do well: for between them these four truly amateur riders of the thermals possess in abundance the skill and experience necessary to make good use of the combative and competitive elements—which, whether in Poland or in Britain, are impartially unpredictable.

ROYAL GATWICK: Last Monday, as reported below, the new Gatwick Airport was opened by the Queen. Here Her Majesty is seen examining a model of the layout, the details being explained by Mr. F. Snow, consulting engineer. On the right is the Duke of Edinburgh and behind Mr. Snow is Mr. Airey Neave, Joint Parliamentary Secretary to the Ministry of Transport and Civil Aviation.

FROM ALL QUARTERS

The Queen Opens Gatwick

LAST Monday, June 9, the Queen inaugurated Gatwick Airport. Her Majesty arrived there at 10.45 a.m. in a Heron of the Queen's Flight, accompanied by H.R.H. Prince Philip.

The unveiling of a commemorative plaque was preceded by a blessing by the Bishop of Kingston and an address from the Queen, who was welcomed in a brief speech by Mr. Harold Watkinson, Minister of Transport and Civil Aviation.

In the course of her speech Her Majesty said: "My husband and I travel by air often enough to realize that without proper ground control and efficient terminal facilities quick and safe air travel would not be possible. I have not the least doubt that the latest ideas and techniques have been embodied in every department of this new airport. I am quite sure that the combination of a good road and rail link with modern buildings and facilities will help to make a favourable impression on visitors to this country. I am sure this airport has a great future before it."

The Queen and Prince Philip spent an hour at Gatwick, touring the facilities and airport buildings, before leaving by car.

Though the first commercial use of Gatwick was by a Transair Viscount on May 30, the first official service, which left a few minutes after the opening ceremony, was performed by a B.E.A. DC-3 Pionair on a charter flight to the Channel Islands.

The new airport was fully described in *Flight* last week.

The R.A.F. and Bloodhound

AN Air Ministry spokesman said on June 2 that the rôle of the ground-to-air guided missile in Britain's defence policy was unchanged: the policy remained as outlined in the White Papers. The R.A.F. had the ramjet-powered Bristol Bloodhound deployed as an operational weapon, and the Army had placed an order for the English Electric Thunderbird.

The spokesman denied newspaper reports that Bloodhound had been relegated to a training rôle and that the R.A.F. intended to wait for Thunderbird. He added, "We agreed some time ago to conduct trials with Thunderbird, and that weapon is in the training rôle."

Commenting on the Ministry statement, Bristol Aircraft, Ltd., said that it "contained the first official intimation that the R.A.F. is in actual possession of Bloodhound, which thus becomes the first homing weapon to enter service in the free world. Although Bloodhound is Britain's first surface-to-air missile to go into quantity production for the operational rôle, the Bristol/Ferranti design team actually entered the guided-weapons field at a later stage than its British competitors."

Germany's adoption of the Bloodhound is reported below.

German Industry Plans

PLANS for the future of the West German aircraft industry were outlined by the Minister of Defence, Dr. Franz-Josef Strauss, in speeches to its representatives last week.

He said that the industry would receive orders worth DM. 2,100m (£179m) to build missiles and aircraft for the German forces during the next seven years, nearly half of this being earmarked for missile construction. All missiles and aircraft would be of foreign design, manufactured under licence in West Germany, the former being of five types—Honest John and Corporal; Hawk, Nike, Bloodhound; Matador; Sidewinder; and anti-tank.

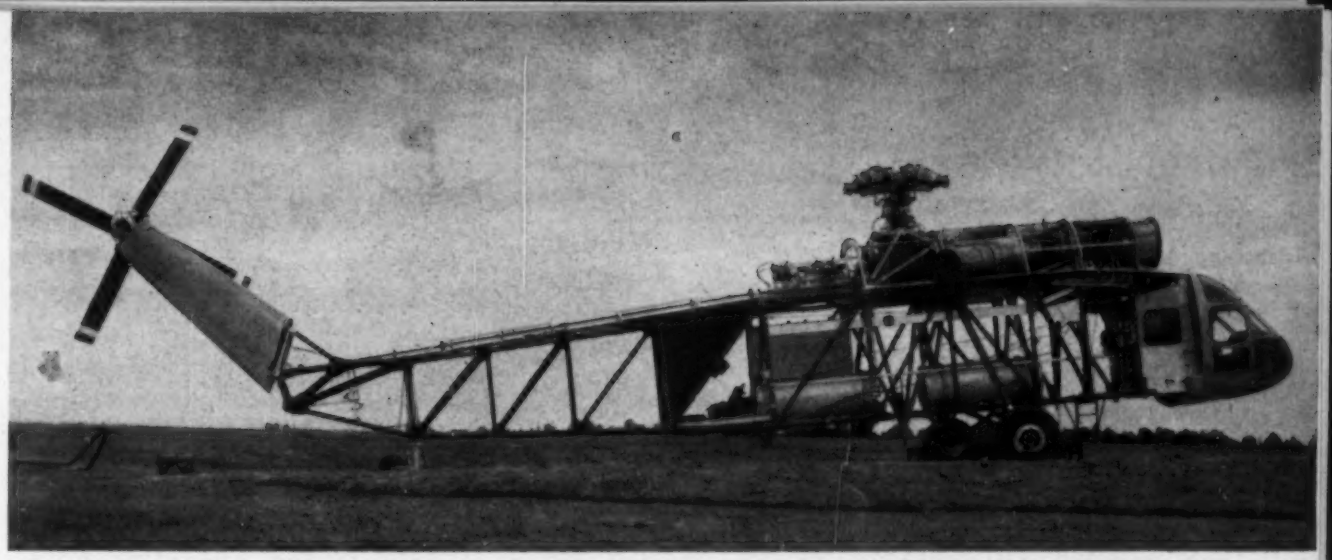
On aeroplanes, the Minister said that the Luftwaffe would until 1963 rely on manned aircraft for two-thirds of its strength; the German industry would build under licence "two types of bombers, one light bomber and one intercepter." The industry's immediate tasks were to manufacture under licence "a light bomber for use also as a short-range reconnaissance and ground-support aircraft" (at least 100 Fiat G.91s are to be built in Germany, and some 50 bought in Italy), and "a bomber for use also as an all-weather fighter, tactical reconnaissance aircraft and fighter/bomber." About 200 of the latter requirement are to be built.

The Napier Story

TO celebrate the anniversary of the arrival of twenty-three-year-old David Napier in London 150 years ago—he is believed to have become established in business in 1808—the famous engine firm of D. Napier and Son are holding an exhibition of their past and present products at the Tea Centre, Lower Regent Street, London, W.1. The exhibition was opened by Mr. Aubrey Jones, the Minister of Supply, on June 2 and remains open until tomorrow, the 14th.

Beautifully presented, it recalls the milestones of the Napier family and engineering history: the early bullet-making machinery that produced 25,000 rounds a day, the gold-coin weighing machine that is still in use in the Royal Mint, the first of a range of motor cars that in their heyday competed in quality and workmanship with the best produced anywhere, and the first R.E.7 and R.E.8 airframes and R.A.F. 3a and Sunbeam aero-engines that Napier built in 1915. Some excellent scale models and well preserved (or restored) early engines tell the Napier engine story from the time in 1918 when the first of the famous Lion engines was produced. The Lion's successes in the Schneider Trophy races, in record-breaking and as powerplant for an enormous range of civil and military aircraft is recalled by a series of aircraft models and

NAPIER HISTORY is represented at an exhibition now in progress in London (see news item in column 2). In this photograph Mr. Aubrey Jones, Minister of Supply, is seen at the opening ceremony: on his right is Sir George Nelson, chairman of the parent English Electric Group, and on his left Mr. H. Sammons, director of D. Napier and Son, Ltd. They are examining the Schneider Trophy, loaned by the Royal Aero Club; it was won by Napier-engined aircraft in 1922 and 1927.



WEST-COUNTRY WEIGHT-LIFTER: This new picture of the Westland Westminster (two Napier Elands) gives some impression of its size; fuselage length is 70ft. The photograph was taken at Yeovil at the end of last week, soon after the aircraft had been rolled out for ground running of its powerplants. Other views are included in the report of a lecture by Westland's technical director on pages 792 and 793 of this issue.

photographs and with a sensible economy of placarding. Napier's piston engines—culminating in the opposed-piston diesel Deltic—have never followed the conventional pattern and the H-type Rapier, Dagger and Sabre engines were classics of their kind.

Napier's turbines bear the same stamp of independent thought and a fairly substantial part of the exhibition is devoted to the Naiad and Nomad and the antelope turbines—the Oryx, Gazelle and Eland. Napier ramjets and boosters and associated aeronautical activities also have their place.

Bristol Research Aircraft

DURING the past week it has been unofficially reported that the Bristol Aircraft Co. has for four years been developing a supersonic research aeroplane under contract to the Ministry of Supply. It is stated to be designed for about Mach 3 and to employ a great deal of stainless steel and ceramic material in its construction. One report suggests that it will have two turbojets. No comment has been made either by M.o.S. or the company.

S/L. J. S. Booth

WITH great regret we record that S/L. John Booth, chief test pilot of Saunders-Roe, Ltd., since February 1956, lost his life in an accident to the second SR.53 prototype on take-off from Boscombe Down on June 5. At an inquest held last Saturday it was found that the pilot lost his life "under circumstances at present unascertained." One witness stated that before the aircraft reached the end of the runway the pilot canopy of the braking parachute was streamed.

S/L. Booth.

S/L. Booth had had a distinguished career as a Service and test pilot before he joined Saunders-Roe (as deputy chief test pilot) in 1949. He entered the R.A.F. on a short service commission in 1938; he was awarded the D.F.C. in France in 1940 and a Bar to it after serving with Bomber Command (1942-44) on night intruder operations. His first experience of test flying was at the A. and A.E.E., Boscombe Down in 1944 and the following year he took the E.T.P.S. course; then in 1946 he became one of the group of pilots who worked with Sir Frank Whittle at Power Jets (R. and D.), Ltd. Later that year he joined Short Brothers and Harland, Ltd., as a test pilot, remaining with them until he went to Saunders-Roe. At Farnborough last year he gave the SR.53 its first public demonstration.

Mr. L. W. R. Robertson

WE also regret to hear that Mr. Leslie Robertson, who until 1957 was manager of the armaments division of Sir W. G. Armstrong Whitworth Aircraft, Ltd., died at his home near Stratford-on-Avon recently at the age of 62.

He joined Armstrong Siddeley Motors, Ltd., in 1934 (after being manager of Kitson and Co., the locomotive manufacturers, and divisional sales manager of the Vacuum Oil Co.) as manager of the railcar department; but when this department was closed down owing to the R.A.F. expansion programme Mr. Robertson went over to A.W.A., where he held the posts of contracts manager and commercial manager before joining the armaments division. In 1957, after a serious illness, he was made A.W.A. publicity manager—a position he held until his recent retirement.

Royal Send-off for Gliding Team

ON Thursday of last week the Duke of Edinburgh wished good fortune to the British team for the World Gliding Championships prior to their departure for Poland. After the team's cars and glider trailers had been driven into the courtyard of Buckingham Palace the pilots and crews were introduced by Mr. Philip Wills to the Duke, who is patron of the British Gliding Association. Introductions over, Prince Philip was keen to examine the four sailplanes in their trailers, and went on to discuss the championships with the pilots. He then entertained his visitors to tea, talking informally with members of the team about some interesting aspects of royal aviation.

After leaving the palace the team went to Horse Guards Parade, where Cdr. Nicholas Goodhart and crew gave a demonstration of rigging and de-rigging his red-and-white Skylark 3 carrying the contest number 13. When newsreel, television and Press photographers had been satisfied, the team left London for Dover, where they spent the night. They crossed by sea to Dunkirk the following morning, and headed for München-Gladbach, the next night-stop on their way to Leszno. [Championship Prospects, pages 805-810.]

R.Ae.S. President-elect

THE election of Mr. P. G. Masefield, managing director of Bristol Aircraft and a vice-president of the Royal Aeronautical Society, as the Society's president for the year 1959-60 was announced last week. He will take office in May 1959.

Elected vice-presidents of the council are A. Cdre. F. R. Banks, a director of the Bristol Aeroplane Company; Dr. E. S. Moult, a director of the de Havilland Engine Company; and Air Marshal Sir Owen Jones.

F4D Climbing Records

IT is reported that the U.S. Navy is submitting, for F.A.I. homologation, rate-of-climb figures achieved by a Douglas F4D-1 Skyray. The details are (from brakes-off): 3,000m (9,843ft), 44.39 sec; 6,000m (19,685ft), 1 min 6.13 sec; 9,000m (29,528ft), 1 min 29.81 sec; 12,000m (39,370ft), 1 min 51.23 sec. The F4D also reached 15,000m (49,212ft) in 2 min 36.05 sec, a height for which no previous record stood. The new figures were set by Maj. Edward N. Lefaivre, U.S. Marine Corps, on May 22 and 23. Current holder of the records is the Nord Gerfaut.

Farnborough Prospects

THIS year's S.B.A.C. Show at Farnborough seems likely to follow the pattern predicted after last year's event by Mr. E. C. Bowyer, the Society's director, when he said that guided weapons would come increasingly into the picture, Service participation would grow in size, and new civil and military aircraft could be expected each year.

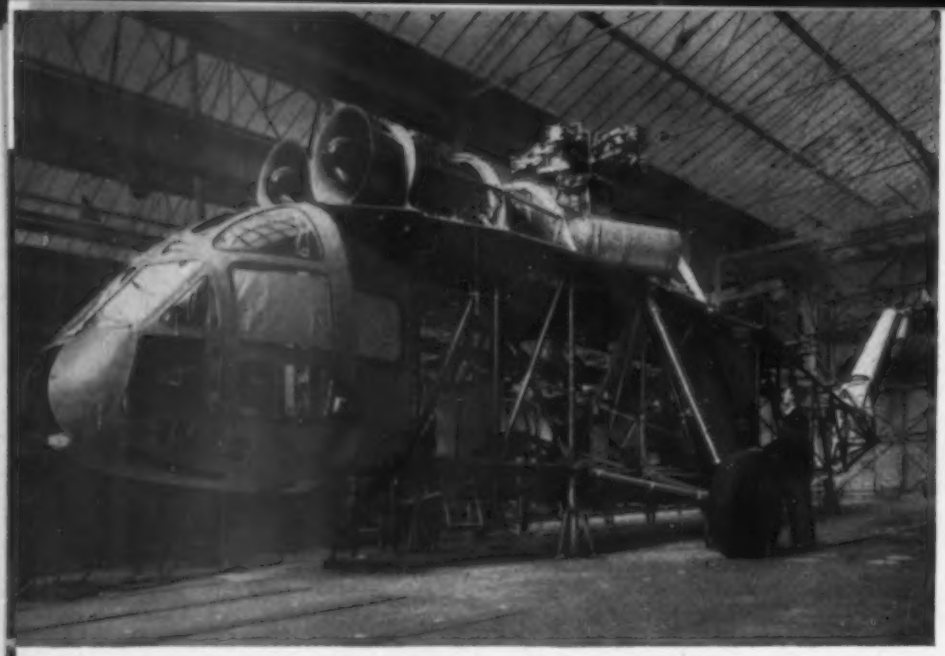
The S.B.A.C. now say that the 1958 Display—the 19th—will include the latest missiles, some of them in their operational environment; massed R.A.F. and R.N. participation; more stand-space in the exhibition building; and an outside equipment display covering an area more than 30 per cent larger than at last year's exhibition.

Although entries for the flying display are not yet complete, the Society considers that with the number of new aircraft which have flown during the past year or so—Comet 4, SC.1, NA.39, Dart Herald, Workmaster and pilotless Canberra among them—there is every prospect that Farnborough 1958 will be a bumper occasion for new types.

WESTLAND EXPERIENCE

REVIEWED IN LECTURE

BY MR. HOLLIS WILLIAMS



On June 3, shortly after the photograph on the left was taken, the Westland Westminster was towed out of its assembly hangar for initial runs of its two Napier Elands. (Outdoor photograph—page 791).

Below is seen the Westminster's extremely clean cockpit layout. In conformity with normal helicopter practice the captain occupies the right-hand seat, and he has a full blind-flying panel. The windscreen slopes sharply towards the pilots, and all-round view appears to be excellent. Engine instruments and transmission controls are on the central console and panel, and various services-controls on the roof panel. Black instruments and panels stand out well from a pale grey background.

The Turbine Helicopter

EXPERIENCE gained by Westland Aircraft, Ltd., during their development of turbine-powered helicopters was discussed by Mr. D. L. Hollis Williams, B.Sc., F.R.Ae.S., the company's technical director, in his lecture to the Helicopter Association last Friday.

The lecturer began by pointing out that development of over-1,000 b.h.p. piston engines had now ceased in this country. For powers between 50 and 1,000 h.p. the helicopter designer had some freedom of choice, but above the latter figure he had no option—it must be a turbine, and his choice was limited by availability.

The indications were that turbine power was likely to cost more than equivalent piston power, and it was therefore important to be certain whether the added cost of turbine power brought definite advantages, or whether the designer was a slave to circumstances and fashion.

Westland were in rather an exceptional position, in that over a period of ten years they had entered into four licence agreements with Sikorsky, and in each case had taken over a successful design with a considerable background of experience based on American piston engines; by substitution of British engines they had then endeavoured to maintain or improve the performance characteristics of the type.

After briefly recapitulating these types, which culminated in the Wessex with Napier Gazelle turbine and the Westminster with its two Napier Elands, Mr. Hollis Williams said that in this way his company had always started from a Sikorsky helicopter type or at least a Sikorsky rotor system with known characteristics, and the powerplant and other changes which they had introduced had never placed them in the position of combining an experimental helicopter with an undeveloped engine. "So far," he continued, "we have been successful with this formula, thanks to the excellence and variety of British engines. But we must regard the future with anxiety, due to the reduction in official support for engine development, which may well lead to a reduction in the number and variety available."

The lecturer next went on to compare piston and turbine power. Mechanically driven helicopter powerplant installations, he said, were characterized by three features: (1) All cooling air supply for engine and accessories must be provided from power sources within the helicopter; (2) The engine was directly connected to the main lifting and controlling elements *via* the transmission; and (3) it must be capable of operation at all altitudes when disconnected from the transmission.

The piston engine required cooling of cylinders, oil, magnetos and accessories. This was usually provided by a fan with appropriate ducting and might absorb up to 8 per cent of the available engine power. The fan must not only be capable of giving an adequate air supply at the right pressure, but also free from high blade-stress levels. For these reasons cooling-fan development could be a protracted exercise. The problem of mounting the reciprocating engine and its associated transmission items—e.g., clutch and fan—involved considerable development of flexible mountings. A clutch was needed so that the engine could be deliberately disconnected from the transmission, and this introduced further complication. Thus the fan, the clutch and the flexible mountings, together with the question of engine vibration, constituted a complex dynamic problem. The necessity for off-load operation of the engine, as in autorotative conditions, introduced a new element in control and a further problem in certain cases, while the possibility of CO contamination must not be overlooked.

Even in relatively low-powered installations engine noise was penetrating, and for civil operations near built-up areas there had been a demand for silencers, bringing a weight penalty and structural complications.

The gas turbine, on the other hand, posed no major cooling problem and, because of its low vibration-levels and absence of fan and flexible mountings, no complicated dynamic problem. There was little or no CO contamination and engine noise was less than with the piston engine.

Among the illustrations in Mr. Hollis Williams's paper was this—one of the first to be released showing the production prototype of the Wessex (Napier Gazelle).

With the fixed turbine, as for the piston engine, a clutch was necessary, but with the turbine's low vibration-level, and with no flexible mountings, clutch development was relatively simple.

Turbines generally used cheaper and safer fuel, but at a higher consumption rate than the piston engine. A turbine powerplant—the complete engine change unit, whether fixed or free—would be considerably lighter than the equivalent piston E.C.U., probably by at least 25 per cent. The weight saving of the turbine was offset by higher consumption; but even this statement had to be qualified, because turbine consumptions compared not unfavourably with supercharged piston engines under high power conditions. Where a mission involved the use of a large amount of hovering power, there was practically no difference. The piston engine showed to advantage when it could operate in the weak-mixture cruising condition. This meant that a helicopter (of conventional drag value) with a boosted piston engine must fly at relatively low forward speeds in order to keep within the economic mixture range, whereas in the case of a turbine helicopter it paid to fly faster and get the benefit of the relatively low specific fuel consumption associated with high power. Thus, a piston engine tended to be better on endurance operations; it did not show up so well if a large proportion of high power was used. The turbine tended to show to advantage on range if possible head-winds were taken into account. For short-range operation, the available payload was greater with the gas turbine by virtue of its lower installed weight.

Turning to the question of fixed *versus* free turbines, Mr. Hollis Williams said that for some years their relative merits had been a favourite subject for discussion, with opinion usually heavily weighted in favour of the free turbine for helicopter applications. He believed that only one company, the Sikorsky Division of United Aircraft, had had experience of both fixed and free turbines. Sikorsky started by converting the S-52 into the S-59 by substituting a Turboméca Artouste fixed turbine for the Franklin piston engine. They followed this with a twin General Electric T58 free turbine installation in a S-58. By now they also had experience with a single T58 free turbine in the S-62. The S-59 did not go into production, but, using the same engine and governing system, Sud Aviation made a success of the Alouette.

"We have tackled the problem in reverse," said the lecturer, "by first obtaining development experience with a single free turbine and now are just starting development work with a twin fixed-turbine installation.

"I must repeat that whereas various authorities have experienced strong preferences for the free tubine for helicopter applications we have so far been unable to reach so definite a conclusion. In our opinion there are pros and cons on both sides and the final decision can only be arrived at after actual experience with both types of installation."

The fixed or free turbine might have a compressor which was all-axial, all-centrifugal, or a mixture of the two. The axial-flow compressor was a remarkable piece of engineering, requiring extreme precision in the smaller sizes. Sometimes he wondered where the practical limit to reduction in size would occur. He was fairly certain that with the postage-stamp size of compressor blade special precautions would have to be taken with the intake. He thought the open type of forward-facing intake would not stand the test of Service use in such cases, and that some form of guarded plenum chamber would be necessary.

The centrifugal compressor was probably the least sensitive to the ingress of foreign matter or to limits of size, and it might be that some mixture of the two would give the best ultimate solution.

Fixed-turbine engines were normally limited by turbine inlet temperature. Thus, if overloaded as by over-pitching, engine r.p.m. fell with rotor r.p.m., fuel/air ratio was increased and up went the temperature, with consequent possible damage. The free turbine engines were limited by torque, which might be either an engine or a transmission limitation.

The axial compressor had a severe surge-line limitation, which was particularly important at low powers. For this reason, very careful control of fuel flow was required in order to avoid compressor stall in accelerating from ground idling to flight idling r.p.m. On the Gazelle an automatic acceleration control unit was provided to avoid compressor stall in this condition.

The lecturer showed curves illustrating operating characteristics, in the low-power range, of the two types of turbine. For the fixed turbine low-power operation at high normal-output r.p.m. was situated well away from the surge line, while with the free turbine low-power operation implied low compressor r.p.m. and power response was affected by surge limitations.

Further curves showed the high-power, high-r.p.m. range, and two operating conditions were used to illustrate another important difference between the two turbines. It was assumed, for the purpose of illustration, that the helicopter power requirement was 75 per cent of the sea-level maximum continuous rating. It would be seen that for both types of engine adequate reserve of power was available at sea level.

A *selected* increase of power resulted in increased fuel flow to engine, and hence increased power from it, and both types of turbine will behave in a similar manner. This applied also when an increase in rotor power requirement occurred from an external source (e.g., gusts). The effect of altitude was illustrated by curves from which it could be seen that, in conditions of insufficient reserve power, there was a marked difference in the behaviour of the two types of turbine. With the free turbine there was less danger of exceeding engine limitations (in this case a torque limitation) when excess power was demanded by the rotor, although rotor r.p.m. would drop. This confirmed the practice, in marginal power conditions, that pilots should operate at high rotor r.p.m. so that loss of rotor speed would not be a serious embarrassment.

With the fixed turbine (whether governed or not), if excess rotor power was required, loss of r.p.m. was accompanied by increase of turbine inlet temperature; in certain designs the compressor might even surge. In the former case a safety device prevented this temperature from exceeding the limit by reducing fuel.

(To be concluded)

The Gazelle installation for the Wessex was extensively tested, with full rotor assembly, in this Napier rig at Luton.

HERE AND THERE

DEBUTANTE: As related on p. 791, the British gliding team for the World Championships visited Buckingham Palace before leaving for Poland in order that the Duke of Edinburgh might see their aircraft. Here a trailer is leaving the palace, in tow of one of the team's fleet of Standard Vanguard estate cars, for the demonstration of rigging given afterwards on Horse Guards Parade.

More Swiss Hunters?

FOLLOWING the cancellation (on June 2) of an order for 100 P-16s, after two prototypes had been destroyed, the Swiss Defence Minister, M. Paul Chaudet, told the Lower House of Parliament on June 5 that Switzerland must either buy another 100 Hawker Hunters or re-examine the possibility of building a foreign aircraft under licence.

First Instalment

THREE A.W.A. Sea Hawks—the first of 68 ordered for the West German Naval Air Arm—were flown from the company's airfield at Bitteswell, Leics, to Bremen on June 2.

WORLD'S SERVICE AIRCRAFT

NEXT week's issue of *Flight* will be a greatly enlarged special number containing, in addition to regular features, a review of the most significant types of military aircraft now being produced by or projected by every aircraft-manufacturing nation. Numerous illustrations will include details of armament, and a special article will discuss the future of manned aircraft. The demand for this number is likely to be heavy, so readers should reserve copies at their newsagents without delay.

Wingless Journey

TRANSPORTED recently by road and sea from R.A.E. Bedford to Belfast, the Short SB.5 is being equipped with a Bristol Orpheus in place of the Rolls-Royce Derwent and is to complete its test programme with 69 deg sweep-back instead of 50 and 60 deg as hitherto. On the 11½ hr road journey from Bedford to Preston (for shipment by the B.R.S. vessel *Bardic Ferry*) the fuselage was carried in a 40ft Queen Mary and the wings on a 33ft Lancaster trailer.

Gnats for Yugoslavia

TWO Mk 1 Folland Gnats have been ordered by the Yugoslav Government for evaluation trials. If these are successful, an order for Mk 2s may follow.

Calling D.H. Old Boys

THE annual Midsummer Ball of the D.H. Technical School Old Boys' Association takes place on Friday, June 27, at the Water End Barn, St. Albans. Tickets, price £1 1s each, can be obtained from the Association's Secretary, c/o Technical School Office, de Havilland Aircraft Co., Ltd., Hatfield.

A.P.R.A. Chairman

SUCCEEDING A. Cdre. Lord Willoughby de Broke, who has retired after holding the office for six years, Sir Lionel Heald has accepted an invitation to become chairman of the Air Public Relations Association. Sir Lionel was wartime head of Air Intelligence 6, which had close links with the (then) public relations division. After serving on Gen. Eisenhower's staff at SHAEF with the rank of air commodore, he was released from the R.A.F. in 1945 to return to the Bar.

McCurdy Trophy Award

THIS year's award of the J. A. D. McCurdy Trophy—for "the top achievement in Canadian aviation"—has been made to James C. Floyd, vice-president engineering of Avro Aircraft, Ltd., for his work on the CF-105 Arrow.

Automotive Proteus

SOME 500 m.p.h. may be achieved by a car currently being constructed for Donald Campbell, holder of the world water speed record and son of Sir Malcolm Campbell, one-time holder of the land speed record. Power will be provided by a special Bristol Proteus, driving through the wheels.

Speed on the Ground

SUMMING up the T.T. races, the annual "Tourist Trophy Review" number is being published by our associated journal *The Motor Cycle* next Thursday (June 19). Prospects for Le Mans are discussed in a special issue of *The Autocar* on June 20, while the following week the journal publishes its "Le Mans Report" number.

A HALF-TON PICK-UP is offered by the new Hiller UH-12-E (305 h.p. Lycoming) "for the first time in the history of the light-helicopter industry." Commercial deliveries will begin next November. British agents are Helicopter Sales, Ltd., of Watford, Herts.

STAFF PARTY: A.V-M. S. C. Elworthy, Commandant of the R.A.F. Staff College, Bracknell, shares a joke with Mrs. Elworthy and Sir Frederick Handley Page at the College's annual At Home last Friday, which took the form of a champagne party.

The Mk 3 Jet Provost closely resembles the Mk 2 shown here, but has ejection seats and certain differences in canopy and equipment.

JET PROVOST T.3

FIRST *AB INITIO* JET TRAINER TO BE STANDARDIZED

THE Hunting Aircraft Jet Provost T.3, first *ab initio* jet trainer to be standardized by any air force and the third consecutive basic trainer designed by Hunting for the R.A.F., is now in full production at the company's Luton factory. The long and very thorough series of development and evaluation trials have been singularly trouble-free; and several actual instructional courses at No. 2 F.T.S., Hullavington, have produced most encouraging results, both in economy and in the quality of pilots. It is noteworthy that with the Jet Provost the time to first solo for pupils with no previous flying experience is still much as it was with the Gipsy Moth trainers of a quarter of a century ago. The aim of the Hunting design team in preparing the Jet Provost has been to produce handling characteristics paralleling those of operational jet aircraft, but to retain modest circuit, approach and stalling speeds and simple handling. They have not tried to obtain the maximum performance from the power available and have thus avoided the rather "slippery" small jet aircraft which does not readily lend itself to *ab initio* basic training.

It is well to note here that the term basic, which in the R.A.F. is used to imply the first training type, denotes in the U.S.A.F. any trainer intended for use prior to gaining Wings. In this account "*ab initio* basic" and primary denote the type of trainer in which a pupil is first taught flying. The confusion in terminology has caused many misconceptions about the actual uses and capabilities of the various jet trainers so far produced.

Although it has now been proved conclusively that jet flying is not in the least difficult, though entirely different from piston-engined aircraft handling, the student who completes his *ab initio* training on a piston-engined type will have to unlearn much of what he has been taught when he converts to jet aircraft.

One must not, incidentally, forget the strong psychological impact made on the student by the start of his flying career: during this formative period the teaching he receives is likely to be subconsciously retained to a far greater extent than is generally supposed; and, because the capacity of the average brain for constructive thought is around 50 per cent in the air of what it is on the ground, his behaviour in an emergency will probably be triggered-off by the subconscious.

A case in point is the piston-trained student's reaction to undershoot in a swept-wing fighter, given the correct approach speed and attitude in pitch. Under these conditions, the L/D ratio results in a moderate rate of sink: if he raises the nose, a step which would be acceptable in a piston aircraft, lift is increased but at the same time an appreciable drag-rise occurs, and the rate of sink may well be almost doubled for a comparatively small loss in speed. A high percentage of jet accidents occurs in this way, for even the application of full power may not be sufficient for recovery. If, on the other hand, the student has had this potential condition demonstrated on an *ab initio* jet trainer which exhibits sink on entering the high-drag range, but which has sufficiently good slow-flying characteristics to enable it to be lifted out with moderate power application, he will be forewarned against it during his formative period.

The incorporation in the Jet Provost of equipment to teach various aspects of the modern art—e.g., retractable tricycle gear, air-brakes and instrumentation in line with modern operational aircraft—has not detracted from its overall simplicity; and slow-speed control paralleling that of its big brothers is combined with full spinning clearance and a stall speed "all down" of 65 kt.

Development History. Original design-studies for the aircraft were begun at Luton in the spring of 1951, when tooling-up for piston Provost production was in full swing. During the course of six years the company had established a close liaison with R.A.F. Flying Training Command, working with them and intensively studying both their instructional and maintenance requirements: considerable effort was put into championing the introduction of "all-through" jet training; and, to back up Hunting thought on the subject, the P.84 was begun as a private venture. The Ministry of Supply became interested in the early stages, and the project was Government-sponsored in March 1953. Use was made as far as possible of existing piston Provost components —mainplanes, main undercarriage legs and tail surfaces—to hurry on the first flight of the prototype, which took place uneventfully on the evening of June 16, 1954, in the hands of R. G. (Dick) Wheldon. During the next three days seven flights were made.

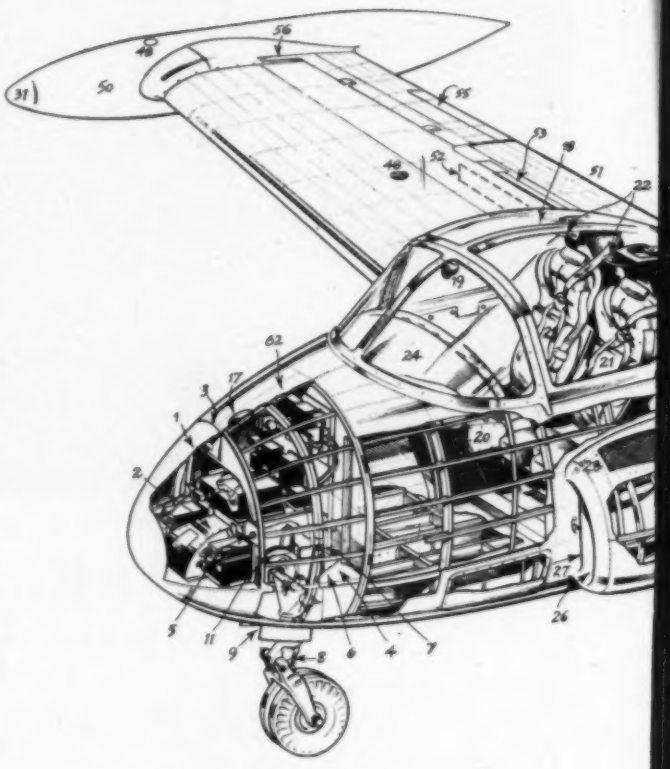
An initial test and development programme of 123 hours was then carried out by the company's flight test department before the prototype was submitted to Boscombe Down for official trials early in November 1954. The Jet Provost's satisfactory behaviour on Luton's rolling grass surface was further improved by fitting shorter legs, and in its production form the aircraft is suitable for continuous operation in its civil security rôle from semi-prepared strips. Meanwhile, a pre-production batch of nine Mk 1s, plus one aircraft for the firm's use as a demonstrator, was laid down, and the first of these took the air on February 19, 1955. Phase "A" of the Service trials began at C.F.S. five months later, the programme comprising 111 hours' flying with three aircraft to determine the aeroplane's actual value as a potential *ab initio* trainer and to recommend a syllabus.

It was Phase "B" of the trials which was to provide the proof, or otherwise, of the pudding, with the practical evaluation of the Jet Provost's reception by actual *ab initio* students. The results achieved were successful from the first, and the aircraft was soon popular with both instructors and pupils; the three aeroplanes were flown over to No. 2 F.T.S. Hullavington, in Wiltshire, and the first course of students began work in August, a further five aircraft arriving from Luton as time went on.

Phase "B" finished on July 2, 1956, with the completion of this

JET PROVOST T.3 . . .

Airframe and engine installation layout of the Hunting Jet Provost T.3 as it will shortly be delivered to the R.A.F. Most major changes from early marks have been made in the cockpit and systems layout.



1 V.H.F. T/R 1987, Rebecca Mk 8 D.M.E., and U.H.F. in nose
2 Nosewheel box
3 Hinged nose cap
4 Oxygen bottles in this area
5 Oxygen charging point
6 Two Varley 24 V, 25 a-h. batteries in parallel
7 External battery socket (24 V)
8 Dowty Liquid Spring nosewheel unit
9 Doors mechanically operated
10 Dowty oleo-pneumatic mainwheel leg
11 Undercarriage actuating cable and spool
12 Undercarriage jack
13 Breaker struts
14 Door-operating sprocket and link
15 Master drum assembly
16 Dunlop tyres, wheels and disc brakes (toe)
17 Cool air to cockpit
18 Rearward sliding clear-view canopy
19 E2B compass
20 Centre console (see cockpit drawing)
21 Martin-Baker Mk 4 lightweight ejection seats
22 Seat firing handle
23 Spring-loaded foot-step
24 Instrument panel shroud
25 Armstrong-Siddeley Viper ASV.8 turbojet, 1,750 lb thrust
26 Bifurcated intake
27 Boundary-layer bleed air
28 Engine trunnions on tubular mounting
29 Firewall carried on engine
30 Fixed firewall
31 Rotol accessory gearbox mounted on firewall
32 Dowty Live-line hydraulic pump (1,000 lb/sq in system)
33 Rotax electric starter
34 English Electric 3,000 W. D.C. generator
35 Generator cooling air
36 Access panel to accessories
37 Compressor tapping for cabin heating, demisting, fuel transfer
38 Methyl bromide bottle
39 Extinguisher spray ring

course, 2,258 hours having been flown altogether; and the most striking point made on the Jet Provost's overall performance by C.F.S. Examining Wing was that student flying ability had risen. "The student standard," the report read, "reflects most favourably on the aircraft's suitability as an *ab initio* trainer: compared to the average pupil, the jet-trained student has, in a shorter time in the air, achieved a more dexterous and better mental approach to the art of modern flying. His repertoire of aerobatic manœuvres, for example, is much more extensive and flown with much more spirit and accuracy."

When this first course progressed to the advanced stage on Vampire T.11s, conversion was straightforward and it was subsequently found that the number of flying hours necessary on these aircraft could be cut, resulting in a considerable cost saving.

A further two courses have since completed training at No. 2 F.T.S., the final one finishing in November last year: by this time a total of 7,023 hours of Jet Provost flying had been logged, 6,045 hours of which were by students. The lowest time to first solo achieved by one of the latter without previous experience was 7 hr 5 min and the average was 10 hr 10 min. None of the students found it in the least strange to be sitting in front of the engine instead of behind it; and out of a batch of fifty, of whom 35 had never flown before, only one—who had some previous flying experience on piston-engined light aircraft—failed to make the solo stage. In this context, it is worth noting that the capacity of an *ab initio* jet trainer for detecting unsuitable students early in the course provides an all-round saving in expenses.

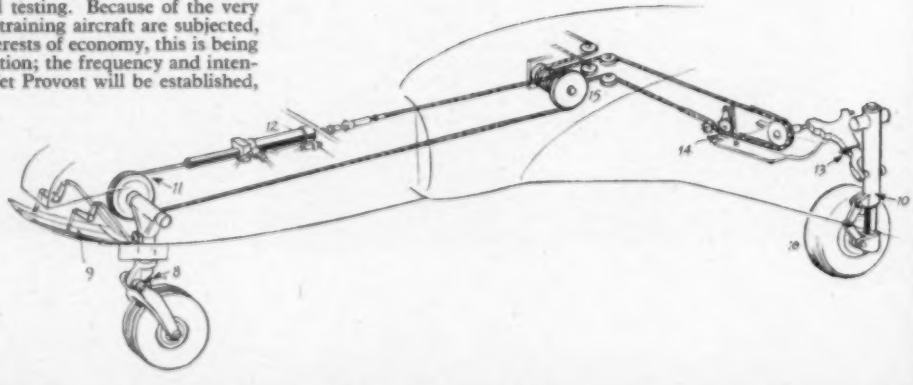
Meanwhile, at Luton, work was going ahead with the Mk 2 version, which was to incorporate many refinements omitted in the Mk 1 in the interests of production speed and economy. This aircraft, a development model to be used as a stepping-stone to the production version, was considerably cleaned up: fuselage lines were smoothed out, hydraulic services were substituted for pneumatic and undercarriage legs shortened by 22in. Later a fashionable dorsal fillet was added. Armstrong Siddeley had been developing the ASV.8 Mk 102 engine giving an additional 100 lb thrust, and the result was an appreciable rise in performance. The first Mk 2 flew on September 1, 1955, and had completed 143 hours' flying by mid-August 1956 in the hands of Hunting's test department; it was then delivered to Boscombe Down, and its release certificate was issued by the M.o.S. on September 6 after 45 hours' flying by the Experimental Establishment.

A fortnight later this aircraft went off to join the Mk 1s at Hullavington and was subjected to intensive training flying, during which time it carried out 260 hours and just under 1,000 instructional landings before being transferred to engine development.

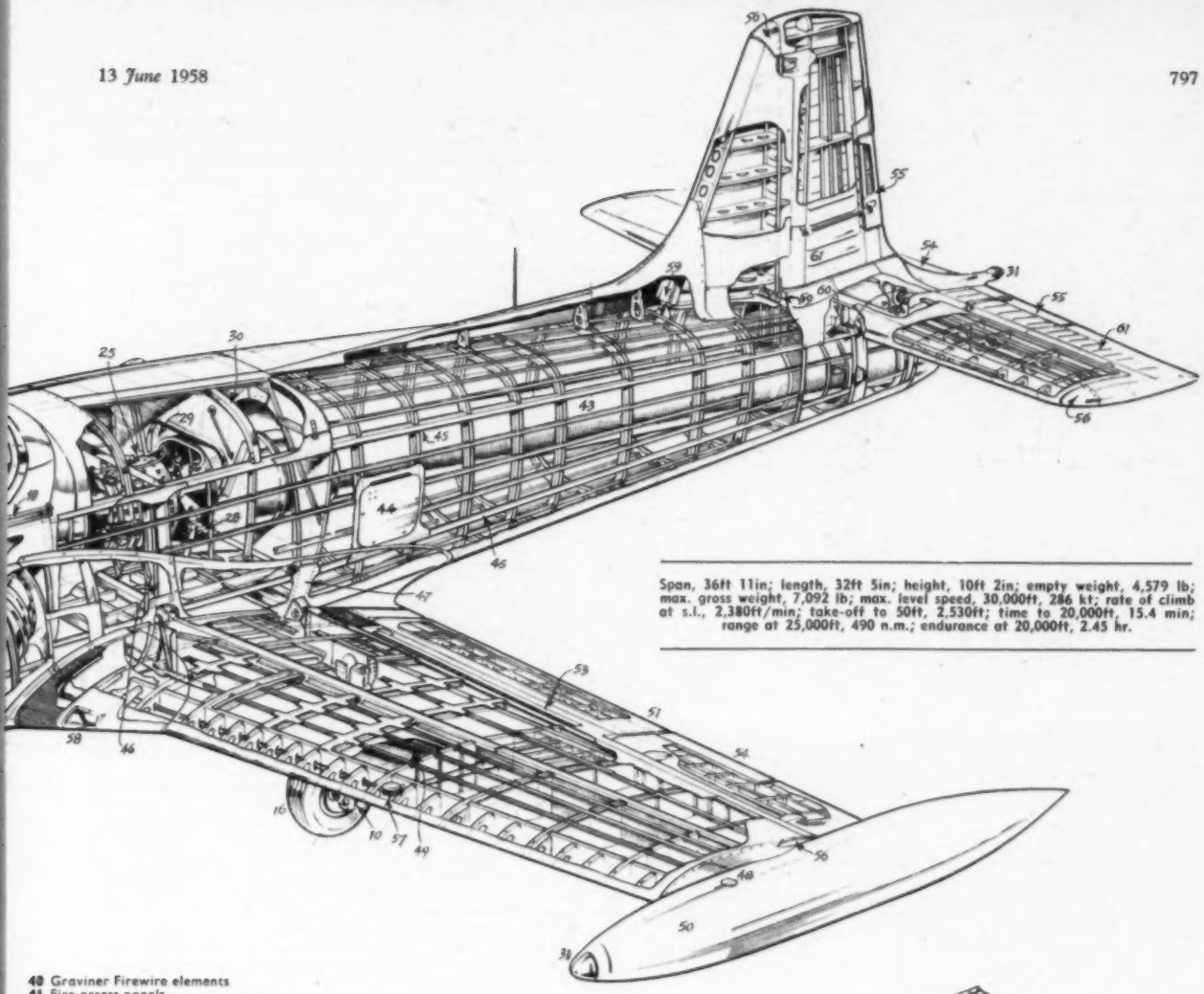
A further three Mk 2s were built for development and demonstration flying, and have been kept busy on winterization trials in Scandinavia, and sales tours in Europe, Canada, the U.S.A. and Latin America. During these trips a remarkable serviceability record was turned in, the aircraft flying up to eleven sorties a day in the hands of numerous pilots, and only the barest minimum of attention being necessary to either engine or airframe. A U.S.A.F. technician said that the Viper appeared to be able "to run for ever" with the most perfunctory daily inspections.

One of these aircraft has been gradually modified to allow practical flight testing to be carried out on as many of the production installations as possible, and thus speed up the eventual clearance of the Mk 3 aeroplane. The contract for a production quantity was received last August and it is expected that M.o.S. release for general R.A.F. use will be obtained around September this year, after the company and Boscombe Down trials have been completed; by this time, 20 Mk 3s will have been produced, and a grand total of over 8,000 hours flown in proving the aircraft and training syllabus since the start of the whole project. This indicates the thoroughness with which the R.A.F. have investigated "all-through" jet training before committing themselves to it.

Currently being undertaken at Luton by Huntings is a programme of realistic laboratory load testing. Because of the very wide intensity of loading to which training aircraft are subjected, and the need for long life in the interests of economy, this is being a prolonged and thorough investigation; the frequency and intensity of all types of loading on the Jet Provost will be established,

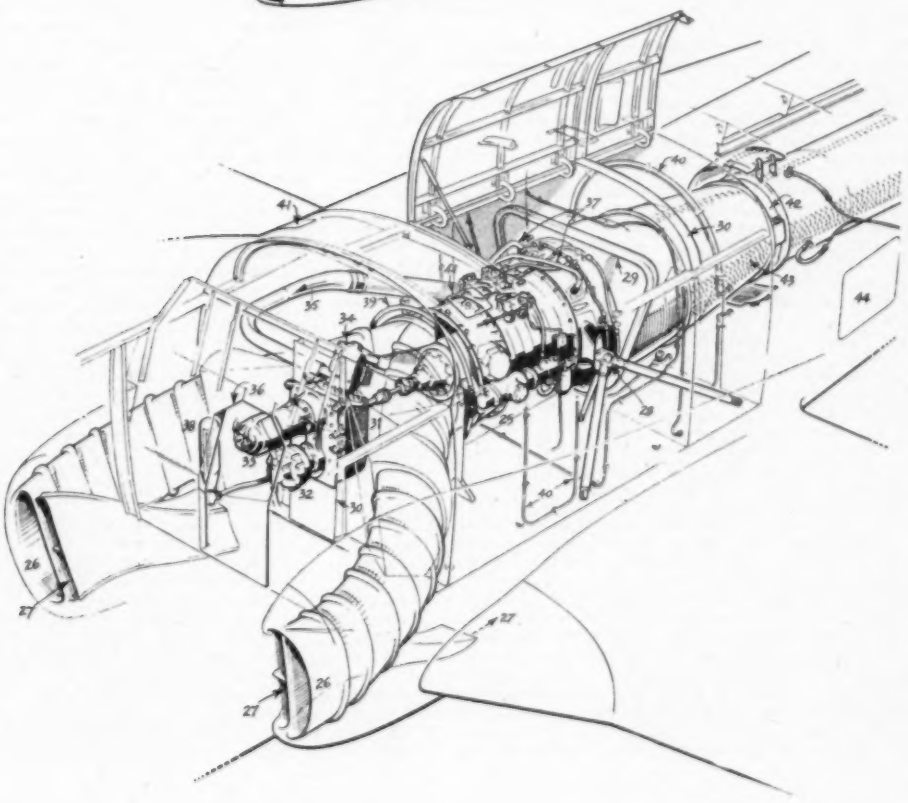


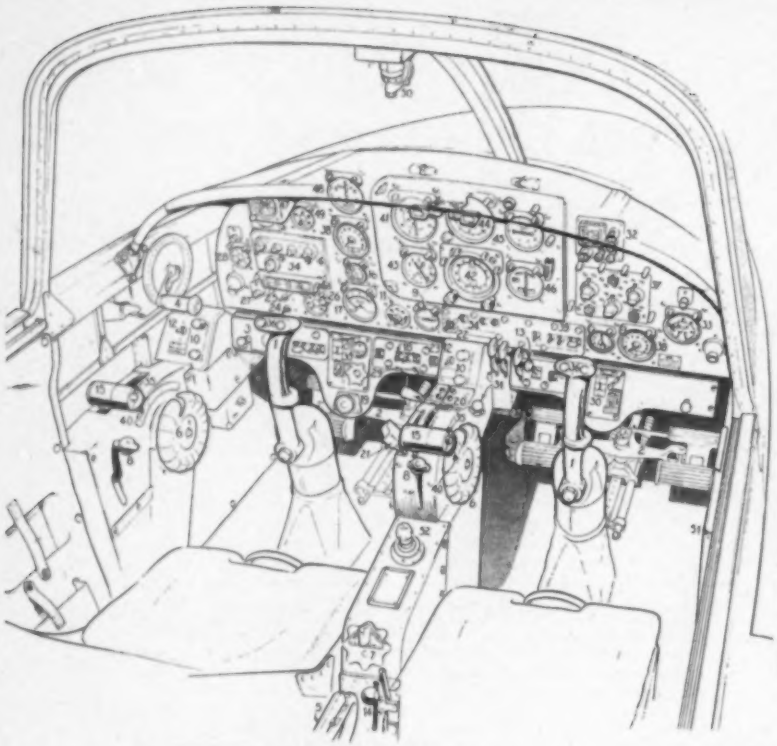
Both undercarriage and fairing doors are mechanically actuated by the cable system here illustrated. There is a single hydraulic operating jack located on the aircraft centreline.



Span, 36ft 11in; length, 32ft 5in; height, 10ft 2in; empty weight, 4,579 lb; max. gross weight, 7,092 lb; max. level speed, 30,000ft, 286 kt; rate of climb at s.l., 2,380ft/min; take-off to 50ft, 2,530ft; time to 20,000ft, 15.4 min; range at 25,000ft, 490 n.m.; endurance at 20,000ft, 2.45 hr.

40 Graviner Firewire elements
41 Fire access panels
42 Jet pipe universal-joint assembly
43 "Refrasil" stainless-steel/silicon blankets
44 Access to 42
45 Four longerons
46 Main spar pick-up frame
47 Rear spar frame
48 Fuel fillers
49 Fireproof Tanks, Ltd. bay tanks, total usable 186 Imp. gal
50 Non-jettisonable tip-tanks, 48 Imp. gal each side
51 Plain flaps, three-position
52 Air brakes on under-surface
53 Lift spoiler
54 Trim tab
55 Geared tab, ground-adjustable
56 Mass balance
57 Aileron control cable and pulleys
58 Taxi lamps (two)
59 Fin spar attachments
60 Tailplane attachments
61 Integrally stiffened skin (pressed)
62 Two 100-amp inverters





The Jet Provost cockpit contains many features representative of the very latest practice, including centralized warning panel and attention-getter, Thorn Plastek edge-lighting, and D.M.E.

KEY TO PROVOST 3 COCKPIT

1 Articulated control column
2 Rudder pedal units and toe brakes
3 Rudder pedal adjustment control
4 Canopy control
5 Canopy jettison
6 Elevator trim
7 Aileron trim
8 Flap selector
9 Flap position indicator
10 Undercarriage selector buttons
11 Undercarriage position indicator
12 Undercarriage emergency retract switch
13 Undercarriage emergency down
14 Flying controls lock
15 Engine power control
16 Tachometer
17 Jet pipe temperature
18 Starter master switch
19 Engine starter button
20 Low pressure fuel cock
21 High pressure fuel cock
22 Emergency relight switch
23 Ignition isolation switch
24 Fuel contents switch
25 Contents selector switch main/tip tanks
26 Fuel contents gauge
27 Fuel low pressure warning
28 Fuel system air pressure
29 Parking brake
30 Oxygen control panels
31 Hot/cold air/demisting group
32 Centralized warning panel
33 Wheel brakes pressure
34 U.H.F. control panel and switches
35 U.H.F. press to transmit buttons
36 U.H.F. mute and tone buttons
37 Rebecca controller
38 Rebecca indicators
39 Taxying lamp switch
40 Airbrake selectors
41 Airspeed
42 Gyro compass (G4.F)
43 Altimeter
44 Artificial horizon
45 Rate of climb
46 Turn and slip
47 Accelerometer
48 Machmeter
49 Oil pressure
50 E2.B magnetic compass
51 Circuit-breaker panel
52 Wander lead hand lamp

JET PROVOST T.3 . . .

representing 25,000 flying hours, and ensuring a minimum useful fatigue life of not less than 5,000 hours in military service. To date, the aircraft has all in all enjoyed an exceptionally trouble-free development career with the minimum of maintenance, and all flight test programmes have passed off uneventfully.

The Jet Provost can be modified during production to fit it for weapons training or civil security operations, for which service an 0.300in machine-gun with 600 rounds can be installed in each wing root fairing. Complementary equipment includes a camera and reflector sights for student and instructor. Additionally, under-wing stores can comprise 8 × 25 lb fragmentation bombs, or 6 × Mk 8 60 lb rockets, or 12 × Mk 5 rockets, or 8 × 25 lb bombs plus 4 × 60 lb rockets; alternatively, 8 × 25 lb bombs and 8 × Mk 5 rockets can be carried.

The Mk 3s to be supplied to the Government of Ceylon, for example, will have armament installation attachments in wings and root fairings, and as currently planned these will permit the mounting of two machine-guns and three rocket rails a side. The aircraft is well suited to this work on account of its seating configuration and handling qualities, and also because of its endurance, with a full rocket load, of nearly two hours at sea level.

Comparative Performance. The Jet Provost is purposely not a fast aeroplane, design emphasis being specifically laid on jet handling characteristics coupled with confidence-giving tractability at low speeds. On take-off the nosewheel is raised at 70 kt and the aircraft lifted at 80 kt; the recommended climb speed of 160 kt is quickly reached and gives 2,400ft/min initially. Time to 20,000ft is 11.5 min; aerobatics in the looping plane can comfortably be carried out at 25,000ft, and in the rolling plane at 30,000ft. Maximum permissible speed is 360 kt or Mach 0.7, although the aircraft has been dived on test to Mach 0.8 without appreciable trim change or compressibility effects. The airbrakes are highly effective and cause no trim-change whatever: a let down speed of 31,000ft/min has been recorded on several occasions.

In parallel with modern operational aircraft there is little warning of the stall, which is square and gentle, with full aileron control throughout: at 72 kt, with the aircraft clean, the nose drops away with mild buffeting. All down, the stall occurs at 65 kt, and with 8,000 r.p.m. this falls to 63 kt. The aircraft is cleared for unlimited spinning and recovers almost immediately.

The figures will show that the aircraft is sufficiently flexible for training to a fairly advanced standard, and this brings up the important question of costs. Formerly, the all-through piston course to Wings standard, totalling about 230 hours, consisted of 60 hours primary and 170 hours advanced, these proportions being approximate: the introduction of the piston Provost/Vampire sequence reduced the advanced Jet stage to 110 hours, and the all-through jet syllabus adopted by the R.A.F. is now leading to thinking along the lines of a 60-hour, expensive, advanced stage. The principal reason for this saving is (a) that the student is already 100 per cent jet trained, and (b) that a proportion of the advanced stage can satisfactorily be taken over by the much cheaper *ab initio* jet trainer. The two-stage system also has inherent savings in the spares backing, servicing equipment and crew maintenance courses.

The scene abroad, however, is somewhat complicated by the fact that few of the jet trainers now in service were originally conceived as *ab initio* aircraft, and these consequently call for a primary trainer to precede them. Attempts to train students from the outset on the larger aircraft have not been followed up. For example, the French Air Force ran one *ab initio* student trial on the Magister, which was, in fact, designed to meet a "jet conversion and weapons trainer" specification. Detailed results have not been published, but the experiment was not continued.

The U.S.A.F. experimented with a T-33 *ab initio* course years ago, but costs were high and results not encouraging. The Cessna T-37 has been put to use by the U.S.A.F. in an intermediate rôle—that is, between the Beech T-34 Mentor piston primary and the T-33 or its supersonic successor. Both T-37 and Magister use similar twin-jet powerplants, though neither of the specifications to which they were designed called for this; neither country had a single unit of sufficient thrust. Twin installations complicate maintenance and double the spares backing, apart from the need for teaching the pupil to handle two engines instead of one. The German Air Force, having ordered the Magister, are to use the Piaggio P.149D as a primary trainer.

At the low end of the scale, neither the Beech Jet Mentor nor the Temco TT-1 are yet standardized in service, and neither has the performance to lead directly into the advanced stage; in this case an intermediate type is necessary making, in all, three types, with a proportionate increase in overall training costs. All in all, it becomes clear from current R.A.F. Flying Training Command thinking that two-stage, all-through jet training produces the best student quality in the most economical manner.

Structure. The Jet Provost T.3 is uncomplicated structurally; it differs principally from its transitional predecessor in canopy, radio, tankage and cockpit layout details and in the strengthening of the fuselage beneath the cockpit floor. The fuselage itself is of all-metal stressed-skin construction, consisting of vertical frames and bulkheads which accommodate the four longerons and the stringers. It is built in two sections, the front one extending from the rear of the engine bay to the nose; and this section has as its basis a structure comprising two double frames to take wing and engine loads, and a keel to absorb the loads from the nosewheel and the ejection-seat guns.

The two pressings making up the forward double frame are attached one to each side of the main-spar centre-section, a member comprising two extruded light-alloy booms with a web reinforced by vertical stiffeners; the after double frame, built on to the rear wing-spar centre section, is exactly similar and between these two is mounted the Viper ASV.8 Mk 102 axial turbojet.

Attached to each side of the Viper's compressor outlet diffuser casing, and close to the engine c.g., is a trunnion which bolts on to the apex of a tubular tripod mounting. The front and rear legs of these two mountings pick up with the forward and aft double frames respectively, and their loads are transmitted through

to the massive centre-section extrusions, while to restrain the engine in pitch a tie strut connects the lower part of the turbine flange to the rear-spar centre-section. This strut is adjustable.

Extending forward from the front double frame is the keel, comprising two deep longitudinal beams made up of extrusions with sheet webs; the rear end of the keel runs under the cockpit floor, which has additional local strengthening, while the forward end forms the nosewheel bay. The rest of the whole front-fuselage section consists of port and starboard assemblies, with a hinged nose cap; decking and bottom assembly; canopy; and engine-bay access panels. As with the cockpit floor strengthening, this structure differs from that of the Mk 2 Jet Provost in that the rear cockpit bulkhead is sloped and strengthened for the attachment of the Martin-Baker Mk 4P seat guns: similarly the canopy comprises clear-view windscreen and rear fairing, with a sliding hood housing a one-piece Suntex moulding. As the cockpit remains unpressurized, the sliding section is still moved by a winding handle or an external lever, but an important addition is the canopy jettison equipment, comprising a cartridge-operated jack mounted under the rail on either side of the cockpit. This device is fired by the initial travel of the ejection seat blind, or by a separate handle. The rear fuselage section is an orthodox semi-monocoque structure comprising six jig-built frame and stringer assemblies—port and starboard sides, bottom and top panels (the latter, as a matter of detail, now built as one unit) and a tail assembly. Extending the full length of the section is a light keel assembly on either side of which are six intercostal pressed diaphragms, and at its after end is a skid rail to facilitate tail-pipe insertion and removal; the tailpipe itself is run in and suspended on a gantry rail, and its rear attachment fitting is carried on the first of two double frames, atop which are located the tailplane lugs. The frame immediately ahead of these carries the rudderpost fitting, and—an innovation since the early Mk 2 series—a folded-sheet dorsal fin is attached after the main fin has been mounted. Rudder and elevators are mass balanced, and have fluted skinning.

The mainplanes are structurally identical to those of the Mk 2 except for the tip-tank attachment lugs, on the face of the end-rib: there are two lugs at the end of the main spar, and two ahead of it. It will be recalled that provision was made in the Mk 1 aeroplane for carrying the tanks below the tip; the new location simplifies the structure and reduces induced drag.

Each wing is jig-built in two sections; the forward section includes the main spar (built of two forged booms with webs stiffened by vertical channel sections and having a two-point attachment direct to the fuselage), ribs and a nose-rib assembly. The after section is bounded by the rear spar, which has a single-point attachment to the fuselage and carries aileron, flap (two hinges each), airbrake and spoiler assemblies: between it and the main spar the undercarriage leg is carried within two full-depth spanwise members in association with a strengthened double rib, on which is located the forged pivot.

The bays for the three bag-type internal fuel tanks are formed by an inner skin, additional rigidity being afforded by formers and spanwise stringers; the whole structure is covered with 22 s.w.g. skin flush-riveted to ribs, formers, stringers and stiffeners.

Such, briefly, is the airframe structure: all components are jigged for maximum interchangeability, Unified Threads are used throughout for international standardization, flush riveting is almost universally employed, and a total of 49 types of access panels are provided to facilitate maintenance and servicing.

Systems. The two cockpit control-columns are of the broken-stick type, and all surfaces can be locked by a single lever mounted on the centre pedestal and retained in the locked or unlocked position by a simple catch. A linkage prevents more than one-third throttle travel when the lock is engaged. Elevators are controlled by push rods from the bottom of each column as far as the main spar centre-section, where both rods join, and the circuit is continued with cables and tie-rods to a lever mounted below the rudder torque tube. From this point operation is by push-rod to a lever on the elevator torque-tube, and each elevator has a geared tab with provision for ground adjustment of the gearing. The elevator trim tab is on the starboard elevator.

The aileron control circuit employs a combination of cables and lateral tie-rods leading from the upper part of each column to a spool-type differential unit at the inboard end of each aileron; a trim tab is on the port aileron.

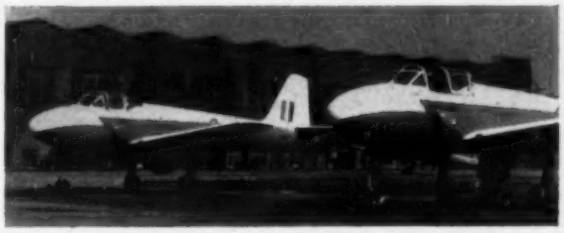
The dual rudder-bars are quickly adjustable through 10in and are connected by push-rods to a centrally placed lever, from which tie-rods connect to cables, a geared tab being provided on the surface. No rudder trim is necessary.

Power for the hydraulic and electrical services is transmitted through an accessories gearbox bolted into a box frame on the after face of the cockpit rear bulkhead. The gearbox is connected to the engine by a flexible telescopic drive, and to it are coupled the Dowty Live-line hydraulic pump and the generator and starter; its access panel is revealed by removing the seats. Services hydraulically operated are the undercarriage gear and wheelbrakes, flaps, airbrakes and spoilers: the former, by Dowty, is identical to that in the Mk 2, and unusual in that it has one jack only, of the through-rod type, located beneath the cockpit floor. From each end of the jack a cable passes to a spool in the nosewheel unit and round a master drum assembly bolted to the front face of the main spar centre section. Incorporated in the latter is a group of four pulleys connected by cables to a chain and sprocket in the retraction mechanism of each undercarriage leg. Being mechanically interconnected, all legs move together. Emergency lowering is by releasing air from the dead side of the hydraulic accumulator to the operating jack. The forward-retracting nose-wheel then unlocks and the gear is extended by gravity and slipstream.

Both flaps are operated by a single jack, which is mounted in the port wing-root and controlled by an infinitely variable selector valve: the valve's follow-up lever is Teleflex-connected to the flap operating mechanism, and returns it to neutral when the flap setting coincides with that of either lever. The two levers are gated to give three-position positive selection and interconnected so that both will negotiate the gates when either is operated.

Both the spoiler (above the wing) and the airbrake (below) are attached to the same torque tube, and operated by a jack in either mainplane; selection is by a switch in the end of each power lever (Electro Hydraulics, Ltd.). Hydraulic pressure for the toe-operated Dunlop disc-brake units is provided by a separate accumulator, and a parking catch is provided.

The fuel system is pressurized to a maximum of 2 lb/sq in either by ram air, taken from the lip of the starboard engine intake duct, or by compressor bleed air, either of which sources is adequate to ensure transfer. Fuel flows from the non-jettisonable 48-gallon tip tanks, if fitted, to the group of three interconnected bag tanks (by Fireproof Tanks, Ltd.) in each wing, each group having a usable capacity of 93 gal. It is then drawn to a central collector tank incorporating a booster pump and a dual transfer valve, the latter developed by Flight Refuelling, Ltd., in conjunction with Hunting Aircraft; this is controlled electrically by a float switch according to the fuel level in the collector tank, and ensures that equal quantities of fuel are drawn from each wing group. A two-gallon recuperator is tapped into the engine supply line and allows 30 seconds' low-altitude, max. r.p.m. inverted flight: it is provided with bleed air taken from the tank pressurizing system and not direct from the engine. Smiths Waymouth capacitance units are fitted in all tanks, and a single fuel gauge in the cockpit can be switched to read contents of left group, right group or total.



Two of the C.F.S. aerobatic team of Jet Provost T.1s.

Electrical power is provided by an English Electric type AE2511 28V (30 kW 100 Amp) generator, a lightweight unit specially developed for the Jet Provost; all the electrics are mounted in the nose and are readily accessible beneath the hinged nose cap. Batteries are two Varley type J, 24V, in parallel, providing 25 amp/hour each; aft of these are positioned two Type 100 A inverters, with automatic change-over, to supply A.C. for the flight instruments including the Mk 4F compass and fire detection circuit. An emergency battery, type J, 24V, 4 Amp/hour, supplies stand-by D.C. to radio, turn-and-slip, and some cockpit lighting.

Of particular interest, since it represents current R.A.F. thought on the subject, is the central warning system. This groups together on one panel, to the right of the flight instruments, the indicators for fire, icing and oxygen-failure warning; a flashing "attention-getter" lamp is provided at left and right centre of the flight instrument panel, and audible warning is sounded in each headset. These signals can be switched out by a cancel button on the panel.

The main D.C. generator supply, regulated to 27.5V, is distributed to the Rotax type V.1107 engine starting panel in the nose, fuel pumps and gauges, the tail-pipe thermocouple circuit for j.p.t. measurements and the Thorn Plasteck edge-lighting for the panel items.

When U.H.F. radio becomes available, Collins AN/ARC-52, built under licence, will be installed: meanwhile, the TR.1887 V.H.F. of the Mk 2 aircraft is being replaced by main and stand-by ten-channel TR.1998 V.H.F. The Murphy Rebecca Mk 8 equipment incorporates Eureka non-directional D.M.E. and Babs, the aerials being mounted respectively under each wing-tip and beneath the port wing-root.

Defense

PART 5: TO CAPE CANAVERAL, LANGLEY A.F.B. AND THE NAVY

By a Special Correspondent

EARLY next morning we were off to Patrick A.F.B. (Cape Canaveral), near Cocoa Beach on the Atlantic coast of Florida. Captain Farar—who, watching the Sidewinder demonstration, commented "This takes all the fun out of flying!" —was obviously affected by the Thunderbirds' exhibition, for he decided to show us what he was pleased to call "an emergency let-down." Which would have been all very well but for the fact that he forgot to close the door, and from the aisle seat in which I was sitting I could see the Atlantic spinning round a blurred Florida without being able to do a thing about it. Somebody suggested he even put his Convair into reverse pitch to achieve the angle of descent he did.

But we skimmed into Patrick neatly and gently, despite a gusty cross wind, and were soon listening to Maj-Gen. Don Yates, who commands the Air Force Missile Test Center.

His briefing on Patrick and the facilities at Cape Canaveral was clear, concise and down to earth. His view of space flight—which is the bread and butter of the newshounds who lurk around his command—is quite simple: at some not-distant date the U.S. *may* be able to put up a conglomeration of rockets which will circle the Moon. Manned space rockets, manned satellites, excursion trips to Mars—all these are beyond his immediate task. That task is to see that the U.S. Air Force gets the military missiles it needs thoroughly tested and able to work. Then he hustled us into a bus to tour some of the vast base.

Not so long ago this piece of scrubland was a haunt of bird-watchers. Now it is surrounded by three security fences and contains its own 10,000ft airstrip so that missiles can be brought in secretly from the manufacturing plants.

The first curiosity was discovering that Pan American had apparently gone wholeheartedly into the missile business. From security police to firemen, everybody wore the PanAm badge. And all the way down the 5,000-mile range, tracking stations are operated by technicians from this airline and its sub-contractor R.C.A. Even the ships on station beyond the Bahamas are PanAm vessels. There is a deep-water harbour alongside Canaveral for tankers, freighters and range vessels.

Our first call was at the Central Control Building, the nerve centre of the range. Here the PanAm superintendent of range operations co-ordinates a team of communications men, instrumentation and interference monitors, the range-clearance manager, the Air Force weather forecaster, the aircraft co-ordinator, the Air Force range safety officer and the missile project officer.

Before any firing a B-17 takes off to search for ships in the immediate (a relative term) range area, and the position of all ships is plotted in the control building. A Convair C-131 is the electronic interference monitor, scanning the dozens of frequencies being used for the test to make sure they are free from interference.

Patrick Air Force Base has more than forty aircraft to carry out this work and to maintain an airlift with the down-range stations. Altogether eleven airfields are involved in the project.

From the control building we scurried off to a launching pad. Armed police watched us as we cautiously approached a huge gantry in which nestled an Atlas ICBM. Eleven stories high, the gantry looked like a not-so-miniature Blackpool Tower—complete with lift. The huge flame deflector for hot run-ups (with the missile locked in place) was freshly painted. Nearby was the blockhouse from which crews from the missile contractors watch their products' behaviour on static tests and live runs.

As we sweltered in the humid Florida atmosphere I wondered how this factor affected the missiles and their equipment. A range officer admitted that it was quite a problem, that special apparatus had to be used to keep the missiles in trim. I gathered that de-hydrated air was useful.

There are four Atlas pads, each with its own blockhouse. Near the Atlas line is being erected the Titan facility, with another four launching pads and the appropriate gantries—even loftier than those for Atlas—and blockhouses nearly completed.

We waited while a DC-6 took off from the strip which divides the range-head in two, then drove in our bus down the wide concrete to the Thor launching pads. The strip is a main highway when not in legitimate use by air traffic.

More than a dozen Thors have been fired from Canaveral, most of them successfully. But just beyond the Thor pads I could see the slender outline of a Vanguard, half hidden by its own gantry. It was standing on the pad where the notorious abortive firing occurred, but when I inspected it there was no sign of damage. Said a Navy man: "We got it all back in order in double-quick time." Earlier, Maj-Gen. Yates had stressed that the real Vanguard launching programme had yet to begin. All early and unsuccessful firings had been tests. If they went off, then that was fine.

A Convair SM-65 Atlas is launched. The small flame-jets are from the vernier motors which give fine control of trajectory and stabilize the missile in roll; the sheet of flame is from surplus fuel from the turbo-pumps.

If not, then there was something to be learned. And as I pottered around this nice-looking rocket in its gantry I was assured that it was to be the first of the actual IGY programme.

From Vanguard to a Redstone pad. Then to a Jupiter site. Thor and Vanguard, Jupiter and Redstone . . . these two combinations could reach the Moon, said our guides.

Exhausted by the enthusiasm of the "missel-men," tired by so much rocketry, we slipped through the security fences to our motel. But there was to be no sleep—for someone had passed round the rumour that there was to be a midnight launching. An hour on the beach by the motel brought no reward, however. It was just as well that the management, which thought sufficiently well of the Press to instal a Western Union teleprinter in the motel office, had thoughtfully put a small bottle of bourbon at my bedside.

Early next morning we were off to Langley A.F.B. up in Virginia, headquarters of Tactical Air Command. There we wondered why the Pentagon ever bothered to invent Strategic Air Command, for T.A.C.'s swarms of fighter/bombers seem able to deliver their own nuclear weapons anywhere in the world with the aid of the ubiquitous tankers.

From Langley we bussed to Norfolk to inspect the Navy and its aircraft. There I became an honorary submariner, complete with certificate, and noticed that the U.S.N. is now using submarines in an early-warning rôle, instead of much more vulnerable destroyers. But what speed they can do under water with their colossal electronic protuberances I dare not guess.

A brief visit to the carrier *Intrepid* (which has escalators like an Underground station) and a swift tour of the Navy's aircraft repair yards, and we were off to New York. Not, however, before Admiral Jerauld Wright had warned us that stockpiling in Europe was of supreme importance—particularly the need to build up our fuel reserves. Said the Admiral "I view with reluctance that, in making her anti-submarine contribution, the United Kingdom, in view of her economic position, has had to cut her other efforts."

New York was its usual bustling, grubby and strident self. But 35 miles out in Connecticut, in a pleasant place called White Plains, we saw something which soon may be common in Britain. This was a surface-to-air guided-missile site, established for three years, and at instant readiness all that time. The site housed a battery of Nike Ajax missiles, and since I had seen all that a British Pressman could see of this weapon in Texas, I was more interested in reactions than in the arms themselves.

I gathered that good public relations on the part of the Army has satisfied the civilians that Nike is just another concept of the great deterrent, and that if it ever has to be used then that's the end of the mission. So the marriage-rate among the G.I.s is high, schoolboys are invited to clamber over the site on the monthly open day, married men are housed in the best possible accommodation at fabulous cost, the officers lecture the local Rotary, and morale is high.

Finally, the last trip in Capt. Farar's Convair. It had carried us more than eleven thousand miles over the States and had behaved in a lady-like fashion throughout. With good flight-planning, she had been on time all the time. We left her at Andrews Air Force Base in Maryland, and watched Farar take-off in a spectacular climb-away, homeward bound for Bolling A.F.B. just outside Washington.

Then into the C-118 (DC-6) of MATS Atlantic Division for Paris-Orly, via Stephenville in Newfoundland.

I had lost eight pounds in weight, gained an appreciation of the United States military might which is already proving invaluable, and learned just how much a dollar will buy. . . .

(Previous articles in this series: May 2, 16 and 23; June 6)

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Adding achievement to achievement,
Fairey Aviation have now built—and flown—
potentially the most important transport aeroplane
in the world, the Fairey Rotodyne.
Carrying 48 passengers or 4¼ tons
of freight it takes off vertically as a helicopter
and having gained height flies forward
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It is the most adaptable rotary-wing
aircraft in the world and the first to offer
operating economy directly comparable to that
of fixed wing aircraft over ranges of up to 400 miles.
The arrangement within the Rotodyne's
capacious fuselage can readily be adapted to suit
civil or military applications.
Powered by two Napier Eland
propeller-turbines with Fairey Pressure-Jets at the
rotor-tips for take-off and landing.

48 passengers
185 m.p.h. cruising speed
400 miles maximum range

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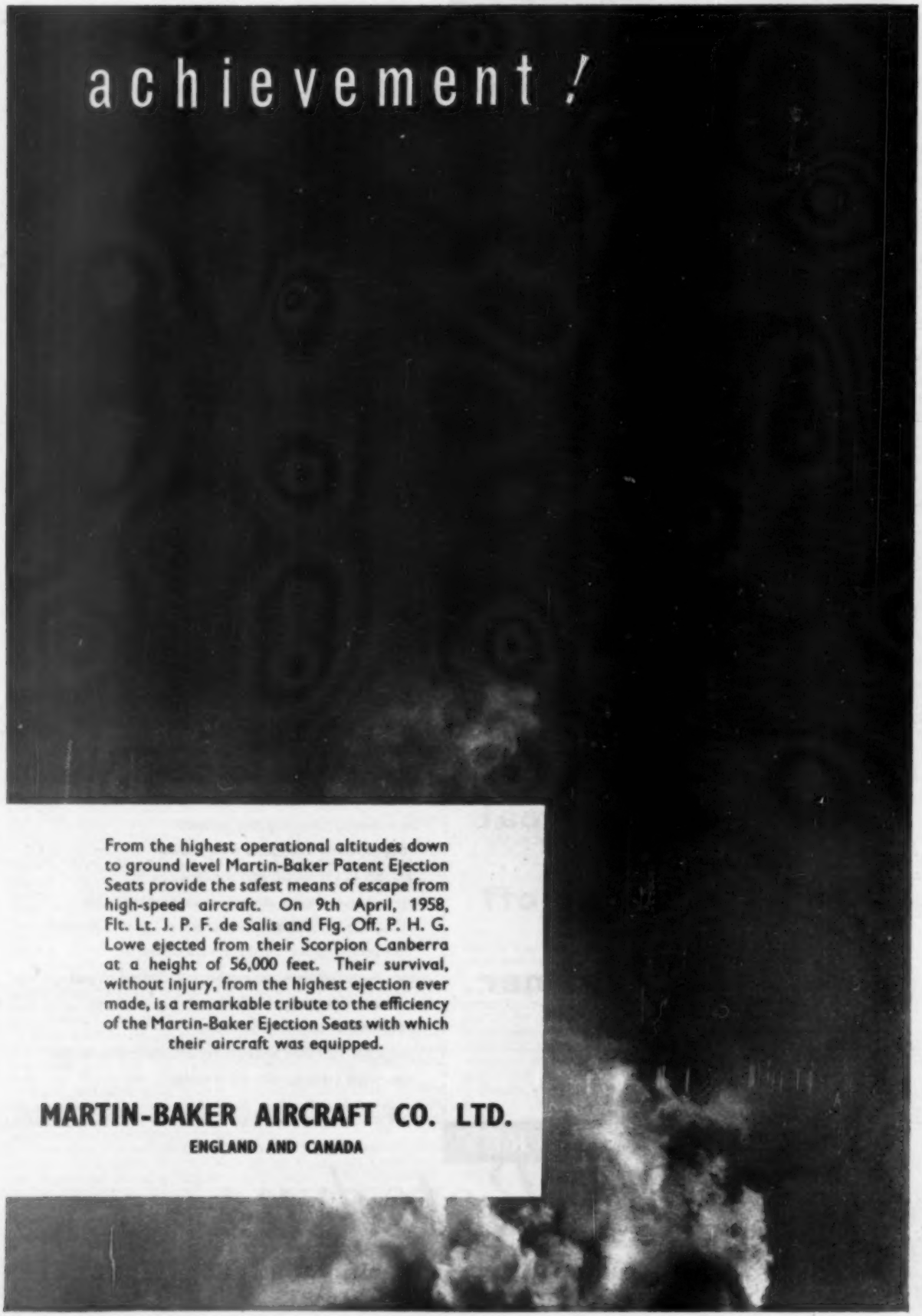


From the highest operational altitudes down to ground level Martin-Baker Patent Ejection Seats provide the safest means of escape from high-speed aircraft. On 9th April, 1958, Flt. Lt. J. P. F. de Salis and Flg. Off. P. H. G. Lowe ejected from their Scorpion Canberra at a height of 56,000 feet. Their survival, without injury, from the highest ejection ever made, is a remarkable tribute to the efficiency of the Martin-Baker Ejection Seats with which their aircraft was equipped.

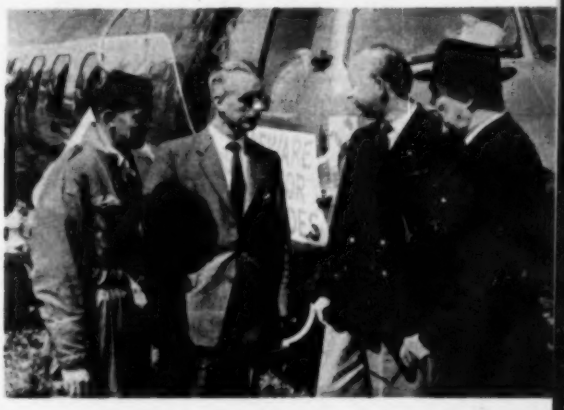
MARTIN-BAKER AIRCRAFT CO. LTD.

ENGLAND AND CANADA

1

3

Helicopters and Tea



DUNSBOROUGH PARK, Ripley, Surrey, the gracious home of Mr. and Mrs. Charles Hughesdon, was last Saturday once again the venue for the annual helicopter garden party. As before, the rally was arranged by the Helicopter Association of Great Britain, and most types of British helicopter were on display. Even the Rotodyne made a teatime guest-appearance—at some altitude—to command the absorbed attention reserved for a visiting star. The Bristol contingent (photograph 1) smart as ever, arrived with two Sycamores in formation with the Bristol 173. Mr. J. Jefferys, shaking hands with Miss Florence Desmond (Mrs. Charles Hughesdon) in photograph 2, later flew his host to Kempton Park races. Next to Miss Desmond is Mr. Hughesdon and, on the right, Mr. T. L. Ciastula of Saunders-Roe. Westland's contribution included (3) their red - and - white Widgeon G-AKTW, which gave several guests their first taste of helicoptering, and the very smart blue-and-white Whirlwind visible in the background. Lord Douglas and his family (4) were brought to Dunsborough by B.E.A. Whirlwind and (left to right, 5), Messrs. J. C. E. Hobbs, P. R. B. Wilson, "Sox" Hosegood and Bill Pegg discussed the Bristol 173. The pilot's-eye-view of the party (6) was taken by *Flight* photographer J. L. McLaren from the Skeeter. And the sun shone, the turf was green and springy and the rhododendrons in full bloom. . . .

"FLIGHT" PHOTOGRAPHS

White Papers, Ministries

— AND MONKEYS : SOME THOUGHTS FOR TODAY

By EXPERIMENTER

IF a million monkeys doodled on typewriters for a million years you would probably find, somewhere among the resulting litter, most of the great works of the English language written out word perfect, even with all the stops and commas in the right places. This was the view of an eminent scientist who was illustrating the laws of probability.

If he was right it seems reasonable to assume that, also among the litter, you would discover a well-balanced and apparently well-thought-out statement on Government Assistance to Civil Aviation Research, together with a related and co-ordinated Defence White Paper. Apart from finding all the stops and commas in the right places one would almost certainly see all those hackneyed phrases, so beloved in Westminster and Whitehall, e.g. ". . . the Government will consider the possibility of some help on its merits and in the light of the circumstances of the case." Or ". . . in the light of circumstances then obtaining, the possibility of . . ." Those phrases would come as easily off the monkeys' typewriters as they do off the lips of Cabinet Ministers who have no intention of being tied down to any very definite policy in the future.

In some ways one can't blame them—the Ministers—when one remembers that they may be called upon to implement a policy twelve months later which they had defined a year before when the winds that blew from the Treasury were perhaps less bitter and could still just be tempered to the shorn lamb, i.e., the aircraft industry. But, equally, one can't blame the aircraft industry if they hesitate over plans for integrating, diversifying or evaporating as requested by the Government when the Government in its turn has intimated that it doesn't quite know what it wants the industry to do or what form of assistance it will give to the industry when it does it.

The situation is, of course, perfectly clear—in a way. The industry doesn't know how many future projects, or how big a future project, it can afford to embark on and the Government doesn't know what help is needed until it knows how many and how big the future projects are likely to be. When that is decided the Treasury may say that the money is not available anyhow. On top of that, design studies of really big future projects are expensive and some doubt exists as to who should pay for them.

If a band of wise men sat round a table, working in a rather less random way than the monkeys, they would probably be able to achieve three valuable services to the country:—

(1) They could sift through the existing pure aeronautical research work on hand and decide which bits of it are essential to keep this country in the forefront of civil aeronautical development.

(2) The could decide which types of civil aeronautical projects we can follow with the best chance of success (e.g., all types of engines, supersonic airlines, freighters, VTOL and STOL ventures, including helicopter variants, etc.).

(3) They could then advise the Government which of these projects needed how much money.

Some people think that the Government have such bands of wise men who have already advised in a reasonably detailed way on promising lines which should be followed. If that advice is available it would be very helpful to all concerned to have it. If it isn't available someone ought to have arranged to get it long ago.

It is possible that this most valuable advice was made available to the Minister's immediate advisers who unfortunately suffered from a disadvantage which would not have inhibited the simian labours: the monkeys would not have had the issue confused by Treasury representations on financial expediency. But pure technical advice should not be tempered by financial considerations when it is first given. It would be of interest to us all to have the unadulterated technical advice first and then hear what the Treasury has to say, with all their doubts and troubles. This may be asking too much even in a democracy; it might even be rather lowering to the morale of the nation to hear all the Treasury's troubles; but nothing could be so lowering to the morale of the aircraft industry as the present uncertainty, which is already acting like a wet blanket on all the great and promising projects for the future.

This is not an indictment of the method this country uses for financial administration, which is probably as good as, or better than, that of any other country in the world. But it is an indictment of an unimaginative and often ill-informed financial policy against which all appeals are ignored.

The financial policy of this country during the last half century has one remarkable similarity to the road to hell. Both are paved with good intentions. The financial good intentions have often been expressed so vigorously that no vigour seemed to be left to implement them. Again and again during the last fifty years a bold stroke of well-advised financial policy could have provided some of our greatest industries with a much more prosperous and far less precarious future than they have today. A great industry dies slowly, even when it is both starved and bled; but it dies inevitably. One hopes that our aircraft industry, which now shows such great promise in the most rewarding technological field of all, will not be starved at a time when a relatively small investment can pay such enormous dividends in the future.

We hear frequently that this country is too small to compete commercially against such giants as the U.S.A. and the U.S.S.R. The two giants themselves repeatedly assure us of the fact. They perhaps forget that aeronautical design and development are not necessarily speeded up and made more efficient by doubling the size of design staffs; another way is sometimes to halve them, thus ensuring that those who are paid to do the thinking actually do it and don't pass the job down to a junior while they doodle distant dreams on their blotting paper. Whichever is the best way, theoretically, of achieving efficient aeronautical design, this country has shown repeatedly that it can compete with others three or more times its size. If clever design and efficient production in the aeronautical world depended on numbers only, then we could get those monkeys to work again, on drawing boards as well as on typewriters; but in fact it depends on well co-ordinated teamwork—and the emphasis is on WELL-CO-ORDINATED. This presupposes a wise co-ordinator in charge who has the education, the experience and (above all) the lack of distractions to enable him to see which way his team should go—and to push them that way.

This country still has enough of the right kind of men (the million metaphorical monkeys are more of a distraction than a help) but we must have the facilities—which means the money. We must know when it is going to be provided and how it is going to be spent. We have the wise men to tell us that—if only some people will listen to them and act on their advice.

THE GREAT CODY CONTROVERSY

EXCHANGES in the current controversy over the date of the first powered and sustained flight in Great Britain have now attained such ferocity that the bout unquestionably warrants a blow-by-blow commentary. We therefore accord this space, outside our Correspondence page, to Mr. C. H. Gibbs-Smith for a quick counter to the sharp lefts and rights delivered last week by Messrs. Geoffrey Dorman and B. J. Hurren:

Sir—After a graceful reference to my second-to-fourth-hand knowledge, Geoffrey Dorman says that my faith in *The Times* "is so naive"; and adds reminiscently: "I remember so well how we laughed at the inaccuracy and downright wrongness of the aviation news published in the daily Press of those days." Bless me, Sir, what merry, sophisticated laughter that must have been; for intrepid pioneer Dorman was at that time (1908) a sweet leg-pulling little boy of fourteen, having been born in 1894. "Colonel Capper," continues ex-prodigy Geoffrey, "enjoyed leg-pulling, as also did Cody. They little realized that fifty years later there would be a Gibbs-Smith to swallow it all, hook, line and sinker." The Colonel must have nearly died laughing as he wrote his official report on Cody; and Cody's mirth must have nearly choked him when pulling the august and collective leg of the Aeronautical Society.

Now B. J. ("Cautionary") Hurren was less than one year old at the time; so his sage remark that "*The Times* of 1908 was one of the worst *news*-papers" reveals a truly prodigious precocity; or did he later become an expert Press historian who somehow forgot to read the other reports corroborating *The Times*? He kindly says "there might be weight" to my views if I had consulted such sources as the War Office archives, the local Press, etc.; and chides me for "merely" quoting *The Times*. If Heckler Hurren—and please listen, too, Geoffrey—had had the slightest real interest in Cody, he would have actually read my brief summary in *Flight*, and asked me for the rest of the evidence: he would then have learnt that Capper's report came from the War Office archives; that the detailed *Times* reports were written by a local man; that I have more than ten contemporary sources; that the local paper Sheldrake's *Aldershot Military Gazette* supports all my other evidence up to the hilt; etc., etc.

Although our witty old gentlemen—aeronautical journalists both—won't have truck with the trivia of facts and evidence, they really should give themselves the laugh of a lifetime by reading what their own brethren said about Cody in the 1908 issues of *Aeronautics*, frivolously edited by a former secretary and president of the Aeronautical Society.

As for "Pop" Broomfield quoting my review of his own book, I still stand by the first 4½ lines of his quote and would only change the dates and distances, about which he has been so naughtily misleading.

I am, Sir, your obedient hook, line and sinker,

CHARLES H. GIBBS-SMITH.

"All these were honoured in their generations,
and were the glory of their times"
(*Ecclesiasticus 44, 7*)

No. 3 OF A SERIES

Supermarine Spitfire VBs
NO. 72 (BASUTOLAND) SQUADRON, 1942

ROTODYNAMICS

Many people who saw the Fairey Rotodyne demonstrated to a selected audience at White Waltham on June 3, and others who watched the TV coverage of the same occasion, remarked upon the unexpected grace of the big helicopter in flight—an impression conveyed here as effectively, probably, as any "still" photographs could possibly do. When the undercarriage becomes retractable—at present it is fixed by bracing struts—an even more pleasing appearance is certain. Seen below are the flight crew at the demonstration—S/L. Ronald Gellatly, Lt-Cdr. J. Morton (co-pilot) and flight engineers Blackburn and Blower.

"Flight" photograph

"Flight" photograph

Prospects for Leszno

THE 1958 World Gliding Championships, which begin next week at Leszno Airfield, near Poznan, promise to be the most varied and interesting yet held. For the first time the Soviet Union is taking part, and for the first time there will be competition in a "standard" category (for machines limited in size and complexity) as well as in a class open to the most refined, efficient and expensive sailplanes that the world's designers can produce.

Compulsory tasks during the two weeks of competition flying (June 15-29) will consist of free distance and either a goal or out-and-return race. Optional tasks, according to the championship rules, comprise 100 km, 200 km and 300 km triangular races, and distance along a set line.

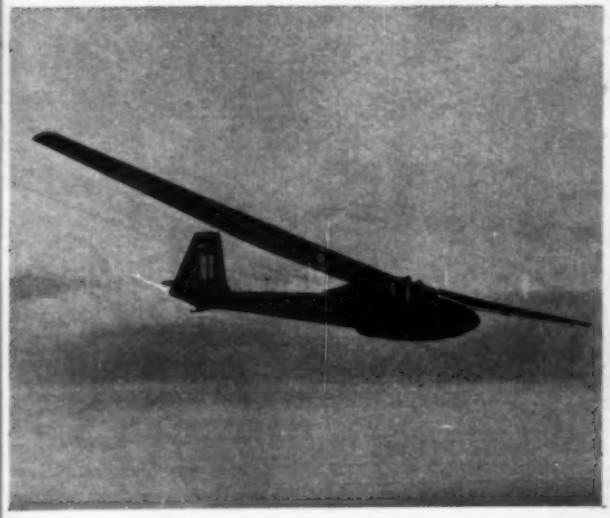
Britain's pilots for the championships will be flying both new and proven sailplanes. In the open class, the new Olympia 419 (right) built by Elliotts of Newbury, and the familiar Slingsby Skylark 3 (below) have been entered; while the 15-metre Olympia 415 and Skylark 2 (see page 808) will be flown in the standard class.

At the time of going to press, the Polish Aero Club organizers had not yet published a full entry list, although 29 countries were earlier reported to have expressed their intention to compete.

Reports from Leszno by *Flight* staff writer Kenneth Owen, the only journalist member of the British team, will appear in *Flight* of June 20, June 27 and July 4. As a foretaste of the championships, this six-page section contains features on the team and its aircraft, including a cutaway drawing and description of the Olympia 419; the background to Leszno as indicated by the development of the Polish gliding movement; and previous world championships.

British pilots have achieved two firsts and one second-place in the last three world contests, and the chances of their doing well at Leszno this year are good. If, in particular, the weather is variable, their high-performance yet practical sailplanes may well score over the exotic, expensive beauties which thrive on unlimited State support—and unlimited thermals. On the other hand, it must be recorded that the Poles themselves—with more Diamond Cs than any other country—are fully expecting to win this year's championships. And they take their gliding seriously, as no doubt their team (in fulltime training since January 16) will agree. As for the final result, *Flight* heads for Leszno with typewriter, camera and an open mind.

ILLUSTRATED WITH "FLIGHT" PHOTOGRAPHS



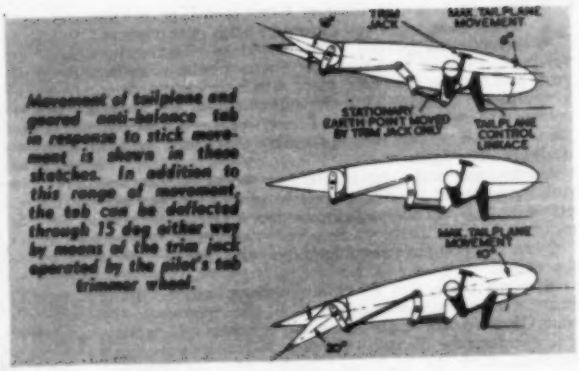
Open-class entrants from Britain are the new Elliotts Olympia 419 (above) and the Slingsby Skylark 3 (below).

PREVIOUS WORLD GLIDING CHAMPIONSHIPS

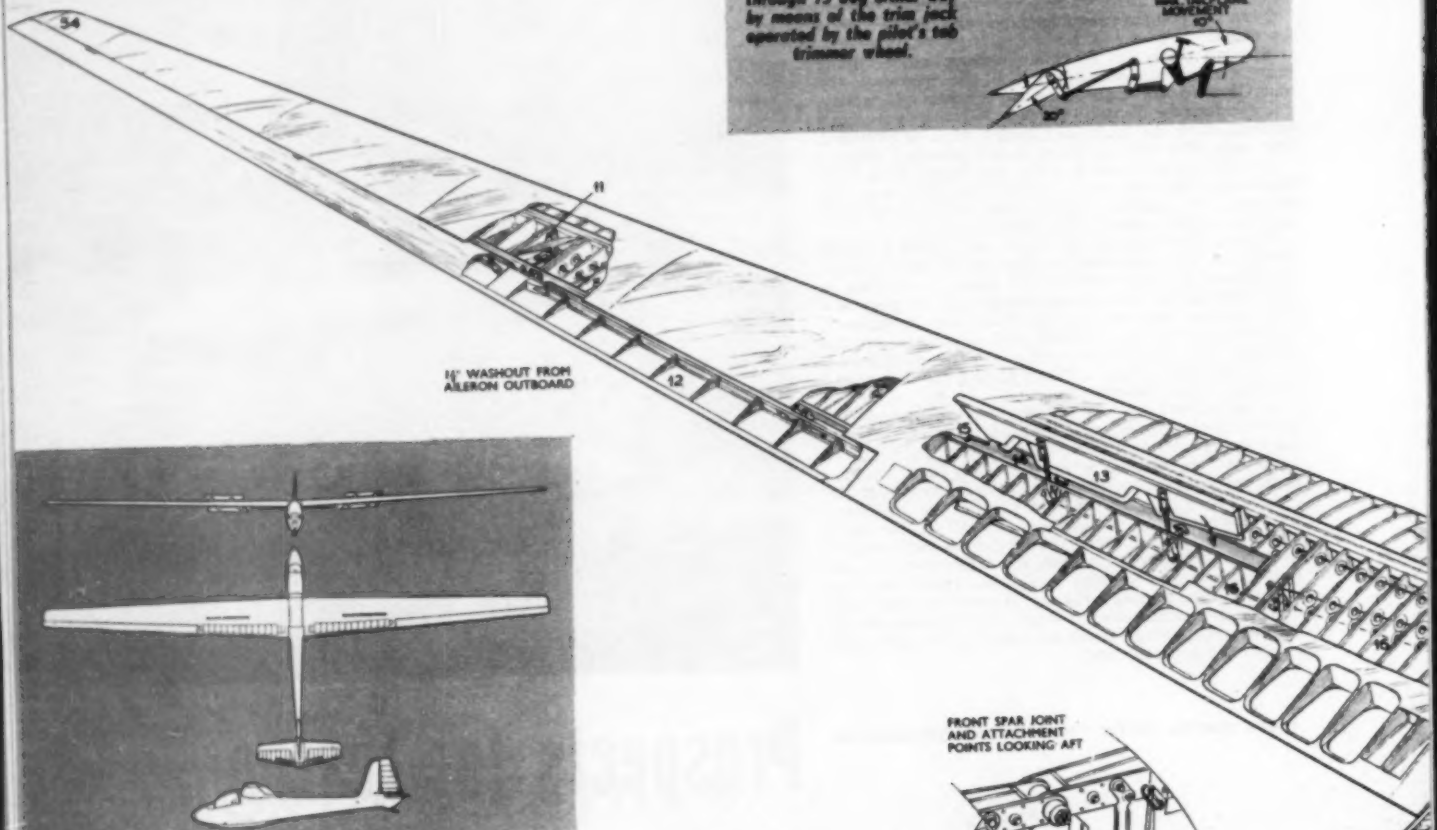
Date	Place	No. of entries	Winner	British team
1937 (July 4/18)	Wasserkuppe (Germany)	28	H. Dittmar (Germany)	P. M. Wait (King Kite) D. Hazar (King Kite) J. C. Neilan (King Kite) I. Price (King Kite) P. A. Wills (Hordle) W. R. Murray (Falcon III) J. S. Fox (Falcon III)
1948 (July 19/31)	Samedan (Switzerland)	20	P. A. Persson (Sweden)	P. A. Wills (Gull 4) L. Welch (Olympia 2) R. C. Forbes (Weihe) P. G. Mallett (Weihe) C. Nicholson (Gull 4) D. F. Greig (Olympia 2)
1950 (July 3/16)	Orebro (Sweden)	29	B. Nilsson (Sweden)	P. A. Wills (Weihe) R. C. Forbes (Weihe) L. Welch (Weihe) P. G. Mallett (Gull 4)
1952 (June 30/ July 15)	Madrid (Spain)	Single-seat: 42 Two-seat: 18	Single-seat: P. A. Wills (Great Britain) Two-seat: L. V. Jaar (Spain)	P. A. Wills (Sky) R. C. Forbes (Sky) L. Welch (Sky) G. H. Stephenson (Sky) P. Fesser (Sky)
1954 (July 20/ Aug. 4)	Camphill (Great Britain)	Single-seat: 37 Two-seat: 10	Single-seat: G. Pierre (France) Two-seat: Z. Rain (Yugoslavia)	P. A. Wills (Sky) G. H. Stephenson (Olympia 4) L. Welch (Eagle 1) A. C. Welch (Eagle 1)
1956 (June 29/ July 13)	St. Yan (France)	Single-seat: 45 Two-seat: 15	Single-seat: P. B. MacCready (U.S.A.) Two-seat: H. C. M. Goedhart (Great Britain)	P. A. Wills (Skylark 2) G. H. Stephenson (Skylark 2) H. C. M. Goedhart (Eagle 1) P. Fesser (Eagle 1)

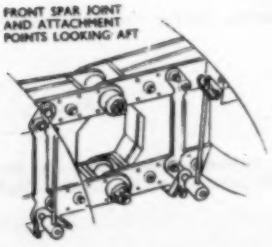
PROSPECTS FOR LESZNO . . .

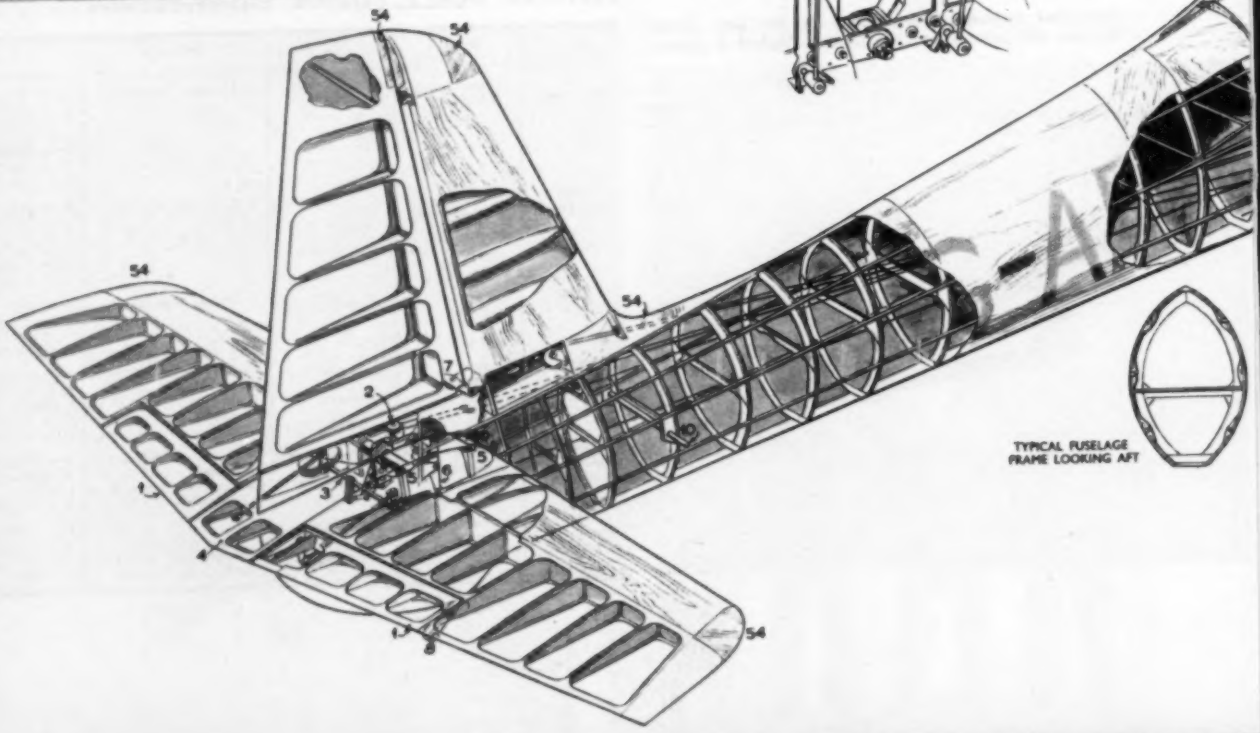
The Olympia 419



Movement of tailplane and geared anti-balance tab in response to stick movement is shown in these sketches. In addition to this range of movement, the tab can be deflected through 15 deg either way by means of the trim jack operated by the pilot's tab trimmer wheel.







THE Olympia 419 single-seat, high-performance sailplane is the result of seven years' development by the manufacturers, Elliotts of Newbury. Starting as a laminar-wing version of the Eon Olympia 2, the Series 4 aircraft can now trace its relationship to the Mk 2 only through such features as the wing root fittings and part of the fuselage structure.

Development has been in four stages. The original Olympia 4, now designated the 401, was G-ALNF. This sailplane had been flying as an Olympia 2 for seven years when it was fitted with a laminar wing, of the NACA 64 series, identical in span and planform with the original 15-metre wing. Frise ailerons were incorporated. This machine, which flew in the 1954 world gliding championships, had exceptional airbrakes but marginal aileron power at low speeds.

The Olympia 402 was virtually a 17-metre version of the 401. Root and tip aerofoil sections were the same, but aileron chord and span were both increased. This hybrid, G-ALNF, was flown by Bill Ivans of the U.S.A. into fifth place at the 1956 world championships, but was destroyed in an accident on the last day of the competitions.

A new prototype, retaining the 17-metre span and incorporating an all-moving tailplane and anti-balance tab, made its debut at the 1957 British national championships. This was the Olympia 403, registered G-APEW. Compared with the standard Olympia its fuselage was extended 10in forward by inserting an extra bay between the main bulkhead and the cockpit, and the canopy and fuselage neck were widened. The fin and rudder were entirely redesigned with increased area, and the tailplane could be hinged upwards for transport. The anti-balance tab, of 2:1 gear ratio and which functioned also as a trimmer, covered the full tailplane span but was later reduced to half-span.

The Olympia 419, the result of redesign of the 403 to give improved tailplane balance and low-speed performance, features a slightly longer nose and greater rudder area than its predecessor. The wingspan has been increased to 18.9 metres and the span of the Frise ailerons has been extended. The tailplane is similar to that of the 403.

Construction of the 419 is mainly of spruce, and all surfaces are skinned with birch ply with the exception of the rudder, tailplane and wings inboard of the ailerons. Considerable use is made of balsa wood as a filling for wing ribs and as a non-structural material for tips and fairings.

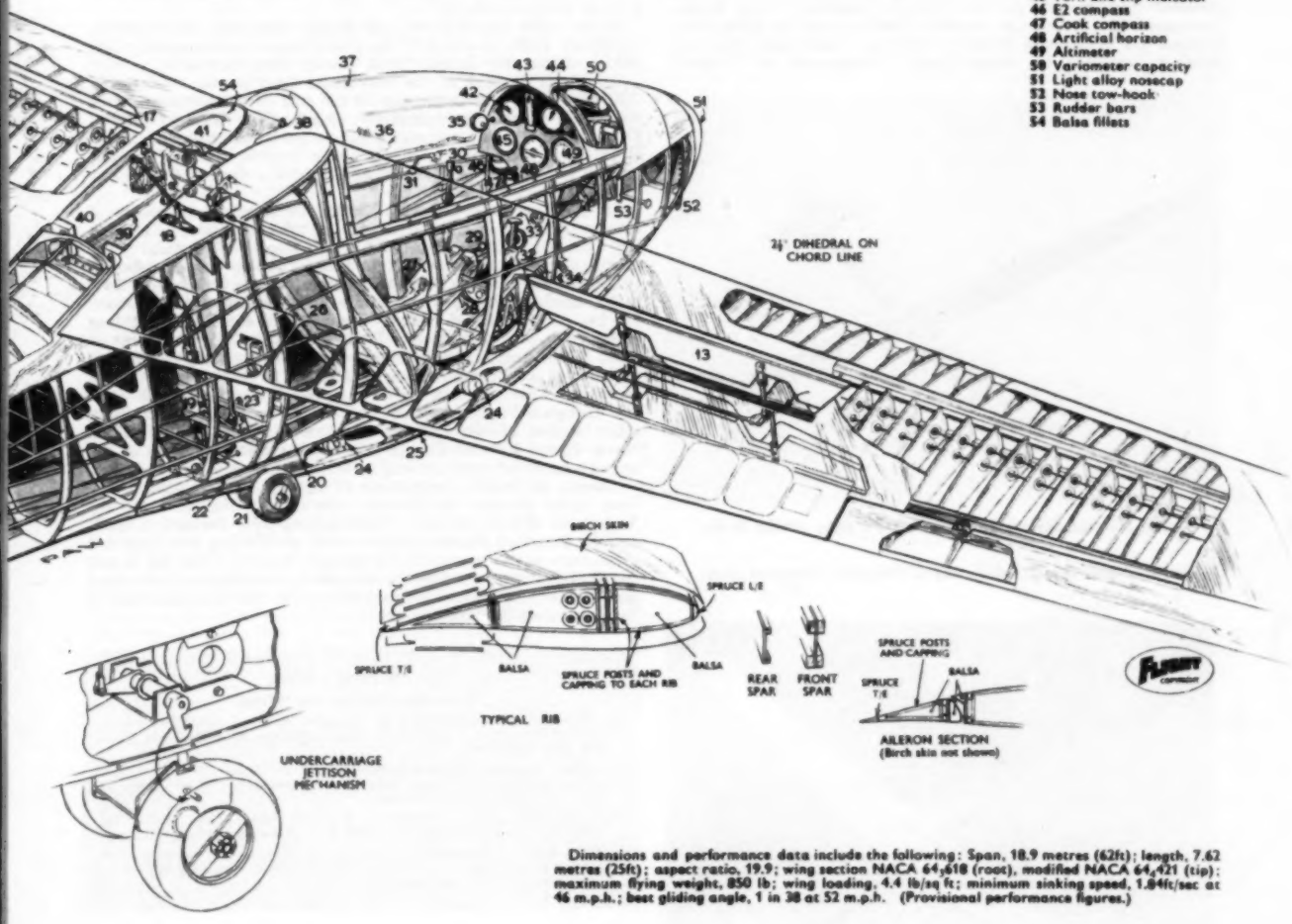
Particularly attractive to the sailplane pilot is the wide canopy and roomy cockpit. The clear-vision panel is well positioned on the port side of the canopy and gives a good view forward. The pilot's essential controls such as tailplane trim, airbrakes, cable release and undercarriage release, are conveniently located for the left hand, leaving the right hand free to fly the aircraft.

Rate of roll is obviously important in any sailplane, and the 419's performance in this respect is particularly good. Although its ailerons are slightly smaller than those of the original Olympia, and in spite of the span—greater than that of any previous British single-seater—the 419 achieves an exceptionally high rate of roll with very light stick forces.

In a straight stall the 419 shows no sign of wing-drop and, although determined efforts will hold a spin, it is virtually impossible to stall the aircraft in turning flight. The large and powerful airbrakes will be a great comfort to the competition pilot who may be faced with landings in small or awkward fields. Their use enables very steep approaches to be made and reduces to negligible proportions the float before touch-down.

KEY TO DRAWING

1 Anti-balance tab
2 Tab screw control
3 Tab linkage
4 Tailplane centre-section
5 Hinge points for folding tailplane
6 Tailplane-incidence control linkage
7 Rudder control lever
8 Tail wheel/skid
9 Leading-edge mass-balance weights
10 Removable ground-handling dowel
11 Aileron control linkage
12 Birch-skinned aileron
13 Air-brakes
14 Air-brake box
15 Rubber seal
16 Air-brake control rods and cables
17 Aileron cables
18 Air-brake control crank
19 Aileron control rods from torque-tube
20 Aileron torque-tube
21 Jettisonable wheels
22 Vyanide skid-cover
23 Rudder control
24 Skid shock-absorbers (rubber)
25 Stainless steel skid
26 Seat back
27 Foam rubber seat-cushion
28 Tab trimmer wheel
29 Undercarriage jettison
30 Air-brake control lever
31 Canopy securing bolts
32 Oxygen supply controls
33 Control column
34 Oxygen mask
35 Tow-release toggle (to port-side hook)
36 Hinged flap to canopy
37 Free-blown Perspex canopy
38 Light alloy fairing
39 Wing/fuselage foam-rubber seal
40 Rear spar attachment points
41 Front spar attachment
42 Airspeed indicator
43 Casim variometer
44 Cook electric variometer
45 Turn and slip indicator
46 E2 compass
47 Cook compass
48 Artificial horizon
49 Altimeter
50 Variometer capacity
51 Light alloy nosecap
52 Nose tow-hook
53 Rudder bars
54 Balsa fillets



Dimensions and performance data include the following: Span, 18.9 metres (62ft); length, 7.62 metres (25ft); aspect ratio, 19.9; wing section NACA 64$_1$618 (root), modified NACA 64$_4$421 (tip); maximum flying weight, 850 lb; wing loading, 4.4 lb/sq ft; minimum sinking speed, 1.84ft/sec at 46 m.p.h.; best gliding angle, 1 in 38 at 52 m.p.h. (Provisional performance figures.)

The five Vanguard estate cars loaned by Standards, and the four glider trailers, seen at Lasham prior to the team's departure.

PROSPECTS FOR LESZNO . . .

The British Team

Pilots and team captain in good humour at Lasham during the Whitsun weekend. From the left are Cdr. Anthony Goodhart, Lt-Col. Deane-Drummond, Mrs. Welch, Cdr. Nicholas Goodhart and Mr. Philip Wills. Olympia 419 sailplane by Elliotts of Newbury. Ironcheater shirts and sailcloth sunslocks by Austin Reed. Photographs by "Flight."

TWO Naval officers, an Army officer and the chairman of a City company are Britain's pilots for this year's World Gliding Championships. Captained by Mrs. Ann Welch, the team is completed by 12 crew-members, of whom eight are retrieving crew and four are base-crew specialists.

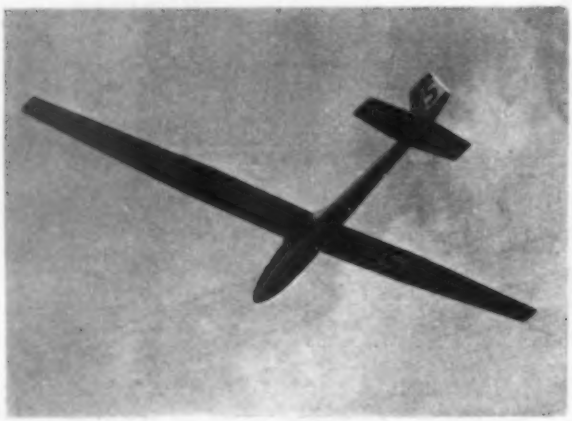
For Mrs. Welch this is her fifth experience as captain of the British team. The only postwar world contest at which she has *not* captained the U.K. entry was in 1954—the year of Camphill and the rain—when she was flying with her husband Lorne in the two-seater class.

Writing in the current issue of the British Gliding Association magazine *Sailplane and Gliding*, Mrs. Welch comments on the high level of pilot skill demanded in world contests. "The sort of flying needed to get anywhere near the top is of such a standard that, within the limit of present-day technique, it must be virtually faultless. The physical and mental strain on the pilot in his efforts to achieve this near-perfection is very great, pressed as he is by competitors many of whom are highly subsidized and who have been in serious training."

In the open class this year the British pilots are Cdr. Nicholas Goodhart, R.N., inventor of the mirror-sight carrier-landing aid, holder of the only British Gold C with three diamonds, winner (with Frank Foster) of the two-seater class at the 1956 world championships, and at present on the staff of the Department of Naval Air Warfare at Admiralty; and Lt-Col. Anthony Deane-Drummond, British national gliding champion, recipient of the Royal Aero Club Silver Medal for a notable series of gliding records in 1957, and commanding officer of a Special Air Service regiment based in Malaya.

In the new standard class, limited to 15-metre sailplanes of comparatively simple construction, the pilots will be Philip Wills and Cdr. Anthony Goodhart, R.N. Best-known of all glider pilots to the aviation fraternity—and the general public—of this country, Philip Wills need have done no more than write *On Being a Bird* to be satisfied with his contribution to gliding and to literature. He has done more, of course. Chairman of the British Gliding Association, world champion 1952, runner-up 1954, recipient of Gold Medal and Britannia Trophy of the Royal Aero Club—and member of the British team at each of the World Gliding Championships since the first in 1937 at the Wasserkuppe—Wills is now recognized as the doyen of British bird-men. Tony Goodhart, elder brother of Nicholas and at present on the staff of Allied Naval Forces Central Europe at Fontainebleau, is holder of the world record for speed around a 300 km triangle.

Among the many contributors of money and equipment who have made possible the British team's entry this year are the Society of British Aircraft Constructors, who donated £1,000; and the Standard Motor Company, who are lending five Vanguard estate cars to the team. Of the aircraft, the two Olympia 4s and the Skylark 2 are owned by the manufacturers, Elliotts of Newbury and Slingsby Sailplanes respectively; while Nicholas Goodhart is flying his own Skylark 3.



Above, Slingsby Skylark 2, standard class entry (Philip Wills).

Below, Elliotts Olympia 415, pilot A. Goodhart (standard class).

PILOTS AND CREWS

Team Captain: Mrs. Ann Welch

1. Cdr. Nicholas Goodhart, R.N. (Slingsby Skylark 3, open class, contest number 13). Crew: Lorna Welch, Bryan Jefferson, Kenneth Owen (Press and publicity officer).
2. Lt-Col. Anthony Deane-Drummond (Elliotts Olympia 419, open class, contest number 12). Crew: Mrs. Deane-Drummond, Maj. John Archer, C. E. Wellington (masseur/engine).
3. Philip Wills (Slingsby Skylark 2, standard class, contest number 86). Crew: R. C. Stafford Allen, Mrs. Wills, H. U. Midwood (aircraft engineer).
4. Cdr. Anthony Goodhart, R.N. (Elliotts Olympia 415, standard class, contest number 35). Crew: F. G. Irving, P. M. Swift, Sgt. John Williamson (radio engineer and reserve pilot).

GLIDING IN POLAND

By J. B. CYNK

THE World Gliding Championships which begin at Leszno next week have once again focused attention on international gliding progress. Poland, host and organizing nation for this year's championships, has in recent years succeeded in re-establishing her place as one of the world's leading gliding countries.

Gliding in Poland began in 1896 when practical experiments were carried out by Czeslaw Tanski in a field near Janow Podlaski (see *Flight*, July 27, 1956). Tanski built a man-carrying glider which he called *Lotnia*. In June of that year, holding *Lotnia* in his arms, he succeeded in becoming airborne after running quickly along the flat ground. Tanski's work inspired subsequent aeronautical efforts in Poland and between 1909 and 1914 many gliders were built, mainly by young people with enthusiasm but little money to undertake the construction of powered aircraft.

Upon regaining her independence in November 1918, Poland had neither an aircraft industry nor any qualified technical personnel. With little chance of powered sporting aircraft being built, aviation enthusiasts turned their attention to sailplanes. In the late summer of 1923 the first gliding contest was organized by the students of Warsaw Polytechnic at the Czarna Gora (Black Mountain), Biala. Nine amateur-designed aircraft took part, but the performances achieved were poor—the longest flight being of only three minutes' duration. Nevertheless the contest aroused wide public interest and marked the beginning of the gliding movement in independent Poland.

The second gliding contest, arranged in 1925 by the Polish Airmen's Association, was held at a coastal hill-site at Oksywie, near Gdynia. Fifteen machines were completed in time for the meeting but again results were disappointing.

A group of Lwow Polytechnic students led by Szczepan Grzeszczyk began an extensive search for better soaring sites. During their first expedition, the first soaring flight in Poland was made on May 26, 1928 by Grzeszczyk, flying Czerwinski's CW.1 sailplane and remaining airborne for 4 min 13 sec. In the autumn of 1929 the same group discovered the soaring site at Bezmiechowa, and on this occasion Grzeszczyk, flying the CW.2, soared for two hours, eleven minutes—a turning point in the history of Polish gliding.

It was at Bezmiechowa that the first gliding centre in Poland was established. Regular training began in the spring of 1930 and the first B and C certificates were achieved in the following year. Gliding was soon officially recognized as an important primary training for powered aircraft pilots, and the sport enjoyed wholehearted government support. The movement expanded rapidly and by 1939 there were 21 gliding schools and 36 gliding clubs and the total number of trained glider pilots exceeded 15,000.

At this time all equipment used was entirely of Polish design and manufacture. Polish gliders were licence-produced in Bulgaria, Estonia, Finland and Yugoslavia and were exported to a number of other countries. Polish teams flew in the international gliding competitions at Rhön in Germany in 1932 and 1937 and, particularly at the latter meeting, set up excellent performances. Wanda Modlibowska remained airborne in a Komar sailplane for 24 hr 14 min, establishing a world duration record for women. Tadeusz Gora, flying a PWS.101, made a spectacular cross-country flight of 360 miles from Bezmiechowa to Wilno. This flight, recognized by the F.A.I. as the outstanding gliding event in 1938, brought Gora the award of the Federation's Lilienthal medal. Poland became the second most active gliding nation of the world—with Germany in the leading position—and the last pre-war statistics published showed Poland to have no fewer than 159 Silver C pilots up to the end of March 1939.

World War 2 resulted in the complete destruction of the Polish gliding industry and severe losses in personnel. Several outstanding designers and pilots lost their lives in German concentration camps or while flying with the Polish Air Force from Britain, and when the war ended gliding as a sport had to be rebuilt practically from scratch. The initial basis of the movement consisted of some 400 sailplanes, mainly SG.38s, Grunau Babies, Weihes, Olympias and Kranichs, left in the country by the Germans.

In spite of extremely primitive conditions, gliding began in May 1945 at Zar and in Fordon. A disused furniture workshop with no equipment, located at Bielsko-Biala, near Zar, was made available to the gliding enthusiasts and it first task was the overhaul of eight ex-German SG.38 primary gliders. In October 1945 prominent members of the pre-war gliding movement decided to combine their efforts to rebuild Polish gliding and resolved that Polish designs should be developed immediately to replace the German equipment. In the circumstances this seemed to be wishful thinking, for not even a drawing board was available at the Bielsko-Biala "design office."

Work began immediately on the reconstruction of the pre-war Salamandra trainer, one example of which had survived the war. By the end of March 1946 all drawings were completed, and this glider subsequently went into production.

In April 1946 the Gliding Institute (Instytut Szybownictwa) was officially created at Bielsko-Biala and two months later J. Niespal and W. Nowakowski conceived the first post-war Polish sailplane. All the drawings for this aircraft—the IS.1 Sep (Vulture)—were prepared on a kitchen table in an unheated room. The Sep sailplane took the air for the first time on June 2, 1947 and only one month later represented Poland at the first post-war world championships at Samaden in Switzerland. Flown by Zientek, it was placed eighth in the final results. The Sep entered production in the autumn of 1947.

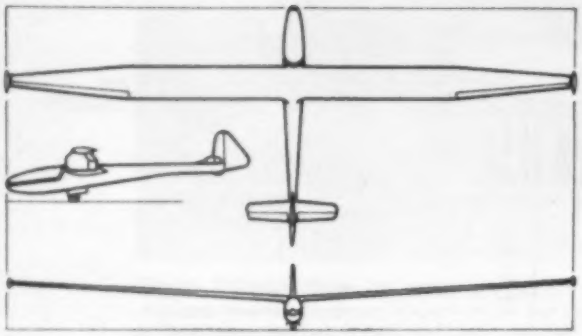
The difficult start had been made, and gliding in Poland began to spread rapidly once more. On April 29, 1948 a new intermediate sailplane, the IS.2 Mucha (Fly), designed by F. Kotowski and I. Kaniewska, was successfully test-flown. It was manufactured in large numbers as the Mucha-bis and Mucha-ter, and an improved version known as SZD.12 Mucha-100 reached the gliding schools in 1954.

The development of the basic Mucha design still continues and, for this year's world championships, a special version known as the SZD.22 Mucha Standard is being produced for the new 15-metre class.

[Continued overleaf

This map of Poland shows the main centres of sporting aviation. A key to the symbols is given below.

- Regional aero clubs
- Advanced gliding centres
- Gliding schools
- Disused gliding centres
- Parachute towers (65 and 165ft)
- Training centres
- Aero club branches and airfields



The SZD.19X Zefir high-performance single-seater.

GLIDING IN POLAND . . .

Design of a primary training glider, the IS.3 ABC, was initiated almost simultaneously with IS.2 Mucha in 1947 and the prototype began tests in the autumn of that year. Several versions have been produced in quantity since then, including a version with a protective nacelle for the pilot. These machines completely replaced the ex-German SG.38s and are still in widespread use with Polish gliding schools. For the transition of pilots from the rudimentary ABC and Salamandras to the comparatively advanced Mucha, a pre-war Komar (Gnat) was reconstructed in 1948 and a version of this machine, the Komar 48, entered production at Bielsko and Jesow. The glider industry was re-organized and expanded and by the end of 1948 there were four factories engaged on glider production. These were No. 1 at Bielsko; No. 2 at Jesow; No. 3 at Poznan and No. 4 at Gdanks: a fifth factory was later established at Krosno.

In December 1949 a special aerobatic sailplane, the IS.4 Jastrzab (Hawk), designed by Niespal, was flight-tested. This machine was intended for full normal and inverted aerobatics and for flights in clouds and storms, having a permissible diving speed of no less than 310 m.p.h. The Jastrzab possessed excellent handling qualities and was produced in comparatively small numbers.

Having provided the Polish gliding movement with a basic range of the most-needed types, the Gliding Institute went on to explore new fields in glider construction and design. In the years 1948-51 the establishment evolved three most interesting experimental designs. The first of these was the IS.5 Kaczka (Duck) tail-first research sailplane, a single-seater which was first tested in April 1949. The fuselage air-brakes of this machine, when not extended, formed the complete rear end of the fuselage. The Kaczka began a new series of tests, during which it was spun successfully, at the end of 1957.

The second, and perhaps the most intriguing of the experimental trio, was the IS.6X Nietoperz (Bat), a tailless design having a swept-forward centre section and swept-back outer wings. This aircraft first flew on February 2, 1951 and completed an initial series of trials while fitted with a rudder. The two-section ailerons operated either differentially as ailerons or together as elevators, and the outer ailerons could be split to act as air-brakes. Later, when the rudder was removed, the control transmission from the rudder pedals was adapted to split one or other of the outer ailerons to give directional control. The Nietoperz has included aerobatics during its flight trials.

In 1954 a new laminar-flow, high-performance tailless sailplane was evolved from the Nietoperz and designated the SZD.13X Wampir (Vampire). This project was extensively redesigned in 1957 and redesignated the SZD.20X, and construction of a prototype began recently. The third experimental sailplane, the IS.7 Osa (Wasp) was basically an IS.2 Mucha with a new 15-metre laminar-flow wing; as in the case of the other two research types, only one prototype was completed.

Meanwhile the Gliding Institute was renamed the Experimental Glider Establishment (Szybowcowy Zaklad Doswiadczalny), and the first two designs to carry the SZD initials, the SZD.8 Jaskolka (Swallow) and SZD.9 Bocian (Stork), have proved to be the most outstanding Polish designs of the post-war era. Both are in the front rank of the world's high-performance sailplanes, holding between them nine world records and almost all Polish national records. Both types have been produced in large numbers and they form the backbone of the equipment of the Polish gliding centres.

Designed by T. Kostia, the Jaskolka first appeared in 1951, with the delivery of production versions starting in early 1954. A shoulder-wing design, this sailplane is said to have remarkably good handling qualities and cockpit visibility. The wing, of 52ft 6in span and 18.8 aspect ratio, is fitted with slotted flaps; loaded weight is 750 lb, wing loading 5.12 lb/sq ft, minimum sinking speed 2.5ft/sec and gliding angle 1 in 26.4.

To obtain maximum performance in varying weather conditions a special version of the Jaskolka, known as Jaskolka Z and incorporating water-ballast tanks, was produced in 1955. In addition several experimental variants were tested in prototype form. These were the SZD.14X Jaskolka M, produced in 1954 and featuring the Rudlicki vee-tail with variable dihedral angle; the SZD.17X Jaskolka L of 1956, with laminar-flow wing, wing-tip shapes, reserve water-ballast and Rudlicki vee-tail; and the SZD.11 Albatros, also introduced in 1956, with increased span.

The SZD.9 Bocian, the first Polish post-war two-seater, took the air on March 11, 1952, and reached the gliding centres in 1954. The machine is of mid-wing configuration with an aspect ratio of 16.2, and its swept-forward wing is fitted with two-part separately-controlled ailerons, and DFS type airbrakes inboard of the ailerons. Span is 59ft 9in, loaded weight 1,103 lb, wing loading 5.12 lb/sq ft, minimum sinking speed 2.7ft/sec, and gliding ratio 1 : 26. The Bocian Z, with water ballast and wing-tip shapes, was tested in prototype form in April, 1956.

A special powered research version, the Bocian-Puls, equipped with four 22 lb Wojcicki pulsejet units mounted in pairs under the wing, was flown in 1956, and the installation of more powerful units is expected shortly. A simplified light-weight version, the Bocian S, was studied in 1953 as a Kranich replacement, but it was dropped in favour of a new two-seater, the SZD.10 Czapla (Heron), which appeared in 1954 and entered production a year later. The Czapla is a cheap, strut-braced, high-wing glider of simple and robust construction, with two enclosed tandem seats and a swept-forward wing.

The Experimental Glider Establishment now has a new generation of gliders under development, and several prototypes are either under test or in advanced stages of construction. An ABC replacement, the new *ab initio* SZD.18 Czajka (Lapwing), is about to enter production; an intermediate sailplane, the SZD.15 Sroka (Magpie), successor to the Komar 48, was tested early in 1956; and a prototype of another machine in the same class, the SZD.16 Gil (Redfinch), is now approaching completion.

Of particular current interest is a new high-performance "super" sailplane of extremely advanced design, the SZD.19X Zefir, the prototype of which is now almost complete. If ready in time, this machine may well be included in Poland's entry in the open class of the World Championships at Leszno. This shoulder-wing design incorporates slotted flaps, air-brakes and water-ballast tanks, and has an aspect ratio of 20.5. Its fame has already travelled far, for the Japanese team recently applied for permission to fly the Zefir at Leszno "regardless of cost." With a loaded weight of 827 lb, span 55ft 9in, and wing loading 5.48 lb/sq ft, the Zefir has an estimated gliding ratio of 1 in 34. Another novel experimental machine will be the M.3 Pliszka all-metal intermediate sailplane, a prototype of which should fly this year.

Export Interest

On quality and performance, Polish gliders are an attractive export proposition, and a number of ABC, Salamandra, Mucha, Jastrzab, Jaskolka and Bocian aircraft have been delivered to various European and Asian countries. During April this year, four Jaskolka and three Mucha-100s were exported to Russia, in addition to a Bocian presented to the Soviet Aero Club; and a Polish sailplane should soon be flying in the United Kingdom. The main importer of Polish gliders and equipment, however, is China, where a team of Polish experts is responsible for the organization of the gliding movement and industry. In 1955 the first gliding school was established there and the following year licence-production of ABC and Salamandra gliders began, followed in 1957 by the manufacture of Mucha-100s and Bocians.

The achievements of Polish glider pilots are impressive. According to F.A.I. statistics up to the end of last year, no fewer than 33 Diamond C badges—more than any other country—are held by Poland out of a world total of 80. Of 34 existing world gliding records, nine have been set up by Polish pilots—again more than any other country. Established to commemorate the 60th anniversary of the birth of Polish gliding, the Tanski Medal for the most outstanding pilot of the year was awarded in 1956 for the first time. It went to a woman, Pelagia Majewska, who in that year established three world records for women.

Since the war the organization of the Polish gliding movement has undergone a number of changes. Political conditions, which seriously affected the development of light aeroplane design and the popular powered-flying movement, had little effect on the sport of gliding, in which comparative freedom of initiative and action was preserved.

Between 1950 and 1953 gliding was controlled by the Polish Aviation League, and during the following three years by the Soldiers' Friends League, the national Aero Club having only token administrative functions during this period. Since the political changes of October 1956, however, the Polish Aero Club has been restored to its proper position as the highest sporting-aviation authority in the country, and all gliding centres and schools are now under its direct control. The gliding movement is completely subsidised by the State, and without this—taking into account the extremely difficult living conditions in Poland—the sport could not possibly exist.

Twice during the last 40 years Poland has built up its gliding movement without any outside help. Twice the Poles have had to develop their own glider industry and training methods, starting with the necessary research from scratch under extremely difficult circumstances. Their strenuous efforts have now secured for Poland a leading position among the world's gliding nations.

Straight and Level

COLLISION is very much on people's minds at the moment. "Personally," said Maj. Gen. Joseph Caldara, U.S.A.F., last week, "I always fly I.F.R., no matter what I'm flying, whether it's a Super Sabre or a Super Connie."

Congratulations to the Major General, who is the U.S.A.F.'s Director of Flight Safety Research, on two counts. One: for saying—in effect—that the separation of all flights in all kinds of weather must be the primary responsibility of ground controllers. Two: for being able to throw away a line like that.

● It's time somebody got thinking about this air transport business. I don't mean that some lofty-minded expert should get a few others of his kidney huddled into a nice fuddly study-group in some sequestered seat of learning. Neither am I anxious that some public body should convene a grand public convention at some noted public centre in Brighton or Buenos Aires. What I want is a plain guileless citizen (so guileless he thinks the Five Freedoms were enunciated by Moses), who will pause in the street to pose a plain question—just loud enough to be heard in an I.C.A.O. annexe. It could be simply framed; as, for instance, "Has post-war civil aviation been (a) a quickening of man's pilgrim soul at the call of his destiny; (b) an all-out struggle for commercial supremacy; (c) an all-in rat race for the lovely lolly.

And while he commands the ear of corporate authority (which will not be for long) he might well solicit their views as to why (a) the commerce of the skies has inspired no poetry of note since Tennyson's *Locksley Hall* (1887); (b) no literature since Kipling's *With the Night Mail* (1909); and (c) no song since *Dorothy Dean* (she went off with a man on his flying machean, grandma knows when).

But suppose there *were* a song about the lofty air lanes. Next thing, that street fellow might start *singing* the thing. Which, in this thirteenth year of I.C.A.O., would stamp him as (a) hep; (b) drunk; (c) insane.

● Typical of the new problems posed during the manufacture of large and fast airframes are several which Douglas have had to face on the DC-8. As is now well known, the upper skin of each wing is formed from a single sheet from the centreline of the aircraft to a point beyond the outer nacelles (*Flight*'s November 1 issue contained a DC-8 cutaway indicating the geometry clearly). Each skin starts in the Davenport, Iowa, plant of Alcoa, as a slab tapered from 0.21in to about 0.13in over its length of 46ft. It is then shipped to the DC-8 plant at Long Beach for skin-milling and bending and stress-relieving and a few hundred other operations. One minor difficulty is that the rail journey from Iowa takes a whole week, and the skins have to be maintained at 20 deg F continuously until the time comes for them to be machined. This is done by packing them in dry ice on the freight cars and storing them in refrigerated areas at the Douglas factory.

Vickers will very likely have to face similar problems with the VC-10. But our "tight little island" is no mean advantage, for even British Railways couldn't take seven days to move a VC-10 skin from the raw-material plant to Weybridge.

● I always admire the work of the Senior Service, and in particular the dedicated way the boys of the Naval anti-submarine helicopter squadrons carry out their tough, rugged assignments. Take 820 Squadron, for instance. The above picture shows the sort of thing they have to endure. As *exclusively revealed* in *Flight* of May 2, No. 820 have adopted the Windmill girls and have painted windmills on their Whirlwinds to prove it. Hence the brief appearance of Christine Fraser, Jill Turner, Lisa Peters and Rosemary Phillips in the background to the above photograph of a scale model of a Westland Whirlwind HAS.7 helicopter. No wonder the Army and the Royal Air Force have recruiting problems.

● The truth about aeroplanes is that, as man's most highly engineered creation, they are inherently troublesome. No one has any illusions about this; but it is nevertheless unprecedented for a manufacturer to allow operators' criticisms of his aircraft to be published. Yet this is what the makers of the Viscount recently did, as readers of last week's *Flight* may have noticed.

This sort of nothing-to-hide recognition of the realities of the air transport business helps to account for the fact that Vickers are still selling Viscounts. They have recently announced four new contracts, all in one week, bringing total sales to 390.

● I predict that the interior *décor* of Gatwick's new terminal building will be a centre of controversy. Colour, the keynote of contemporary architecture, is almost entirely absent. Predominant shades are white, grey and black, and the structure of the main concourse is left quite unadorned, to give a "feeling of structural reality."

The supporting pillars are raw, grey concrete, straight from the sawboard shuttering in which they are cast. The frame of the terminal is formed from slabs of pre-cast concrete, again unpainted. The throngs of passengers and spectators are intended to supply all the necessary colour. (Incidentally, no attempt has been made to silence the concourse—noise and bustle are regarded as essential to the atmosphere of the building.)

Considering that Gatwick is Britain's holiday airport, I wish that the decoration had been a little more cheery. And, conditioned as I am by the stimulating architectural experience of the Brussels International Exhibition, I wish that the lines of Gatwick's terminal ("a glass and steel box sitting on top of a 20ft concrete substructure") were just a shade less severe.

I am comforted to read, however, of one innovation that I am sure must make Gatwick unique among the world's airports. For the new (and very legible) internal signposting *an entirely new alphabet* has been designed.

● A lot of people seem to expect boffins engrossed in abstruse work to be subject to nervous breakdowns. Personally, I don't believe it (except, perhaps, for really responsible men in such fields as hydro-electric power, where a "yes" or a "no" can mean ten years and a hundred million pounds). It's personal worry that causes crack-ups. I know one man—an aerodynamicist—who nearly went silly worrying whether or not Atlantis (the lost continent) really existed. In contrast, his workaday problems, being creative, were stimulating and probably did him a lot of good.

● It is very easy to become blasé about flight-hours, especially when one does not have to log them oneself. Numerous airline captains have recorded more than 40,000 hr, but I am nevertheless tremendously impressed by the total of 22,600 recorded by Chief Boatswain Patrick J. ("Pappy") Byrne, U.S.N. ret. When he retired in March 31 he had completed more hours than anyone else in the U.S. armed forces, and all his time was logged during naval service. Admittedly a considerable amount was gained on blimps (lighter-than-air craft), but he also flew some 140 types of aeroplane. Anybody care to claim more military flying than this?

ROGER BACON

CORRESPONDENCE

The Editor of "Flight" is not necessarily in agreement with the views expressed by correspondents in these columns. The names and addresses of the writers, not for publication in detail, must in all cases accompany letters.

Circumnavigational Load Shedding

IN your April 25 issue, the "Straight and Level" column contained an item which claimed that a B-52 flying from west to east "lost" 3,500 lb (out of 400,000) and likewise "gained" 3,500 lb flying in the opposite direction. The item closed with the question: "Anyone disagree?"

I disagree. A derivation of the general relationship of the apparent weight-reduction to speed, heading and latitude, together with sample calculations for a speed of 1,000ft/sec (592 kt—about the order of magnitude of the B-52's speed) is enclosed. [Our correspondent attaches several pages of workings and diagrams—Ed.]

These calculations show that there is indeed a weight reduction of 3,800 lb for a B-52 flying east on the Equator at 1,000ft/sec. However, there is *never* a *gain* in weight, no matter what the direction of flight. In fact, if the airplane turned around and headed due west there would still be an apparent weight reduction of 160 lb. Heading north or south, the reduction is 1,980 lb. Even if the airplane were parked in a hypothetical equatorial hangar, there would be an apparent reduction of 870 lb.

At higher latitudes, where B-52 operations are no doubt more frequent, the effect diminishes in magnitude. The chart on page 5 of my enclosure shows plots of the weight loss as a percentage of total weight for the Equator, 45 deg north or south latitude, and for the polar regions, as a function of the heading.

The reason the apparent weight-reduction varies in the manner shown is that it depends on the square of the magnitude of the vector sum of the ground speed and the tangential velocity of the surface of the earth. This quantity is always greater than zero.

Anyone disagree?

Seattle, Washington. FRANKLYN J. DAVENPORT.

Memories of the Fairey Fox

THE letter from Mr. L. Massey Hilton ("Deck Landing the Fox") in your issue of February 28 recalled to me as an ex-member of No. 12 Squadron (1927 to 1932) at Andover, the days when the Fox delighted the crowds at Hendon Displays. No. 12 was, of course, the only R.A.F. squadron equipped with these aircraft, and we, its members, were very jealous of our own special charges. Other squadrons, fighter and bomber alike, were apt to be regarded with disdain; our Foxes could outshine them all, in all senses of the word. Our engine cowls and all bright parts had to glisten, and woe betide a fitter whose copper water pipes beneath the cowlings did not shine to a flight sergeant's satisfaction. I suppose we were dubbed "Shiny 12" with some justification.

The Fox's 12-cylinder water-cooled Curtiss D.12 engine was the first I met with having its carburettor fitted within the vee of the two cylinder blocks. I seem to remember separate inlet and exhaust camshafts on each block, and each pair of valves being operated by one cam through a connecting bridge-piece (the accurate setting of the clearances called for some degree of skill). It was a direct-drive engine, fitted with short exhaust stubs, and a Fairey Reed propeller of about 6ft 6in diameter. Apart from its high speed, the machine's *pièce de résistance* was, of course, its impressive roar on pulling out at low level from a high-speed dive.

There were few maintenance worries, but I remember the Fox providing some interesting, and in retrospect amusing, moments. Two radiators were installed in the cooling system; the main, always in circuit, was retractable. The second, fitted in the undersurface of the centre-section, could be isolated by cockpit control for speeding up the warming-up process, and, of course, was always in the slipstream. Ethylene glycol had not been introduced—in cold weather the draining of systems or the use of catalytic lamps was the order of the day—and it did sometimes happen that some unthinking character, anxious to get his engine warmed up on a particularly cold morning and to return to the comparative comfort of a cold hangar, would isolate his centre section radiator and freeze it solid within a few short minutes. I know. I did it once!

Shock absorption in the undercarriage struts was by a series of rubber balls, and the artifices we employed to get the requisite number forced into the leg tubes were many and various. What happened to the old balls after removal from the struts I will not dwell upon—we of "Shiny 12" were a fairly high-spirited bunch.

Then came the Curtiss D.12 spares difficulties. I hesitate to reflect on how, with wire brushes and scribers, we cleaned out corrosion pits in the water-jacket side of the cylinder barrels and filled them with soft solder. But the engines continued to run and to give first-class service.

I have in my possession a photograph of a Fox taken at Andover in, I should think, 1929 or 1930 after the squadron C.O., the then S/L. Stevenson, and his air gunner, Cpl. Hancock, had won the Cock Trophy.

The squadron was genuinely depressed when it eventually lost its Foxes and had to assume a status comparable with that of other similar squadrons. To those, like myself, who had something to do with its maintenance and operation, the Fox will always be regarded with a certain affection.

Cambridge. E. W. GOODE.

Early Agricultural Aircraft

I FOUND Capt. R. Bradbury's article entitled "Crop Control" (May 2 issue) very interesting and it set me thinking when crop dusting first began.

For instance, when and what was the first aircraft adapted for crop dusting (or sowing, for that matter)? Secondly, what was the first aeroplane designed throughout for agricultural use? I found in a 1926 edition of *Jane's all the World's Aircraft* a photograph of an American Huff-Daland Petrel 5 biplane (200 h.p. Wright Whirlwind Radial)—a special aeroplane for agricultural use. The Grumman Ag-Cat bears a striking resemblance to the Petrel 5.

Birmingham, 14. MAURICE AUSTIN.

Roger Out?

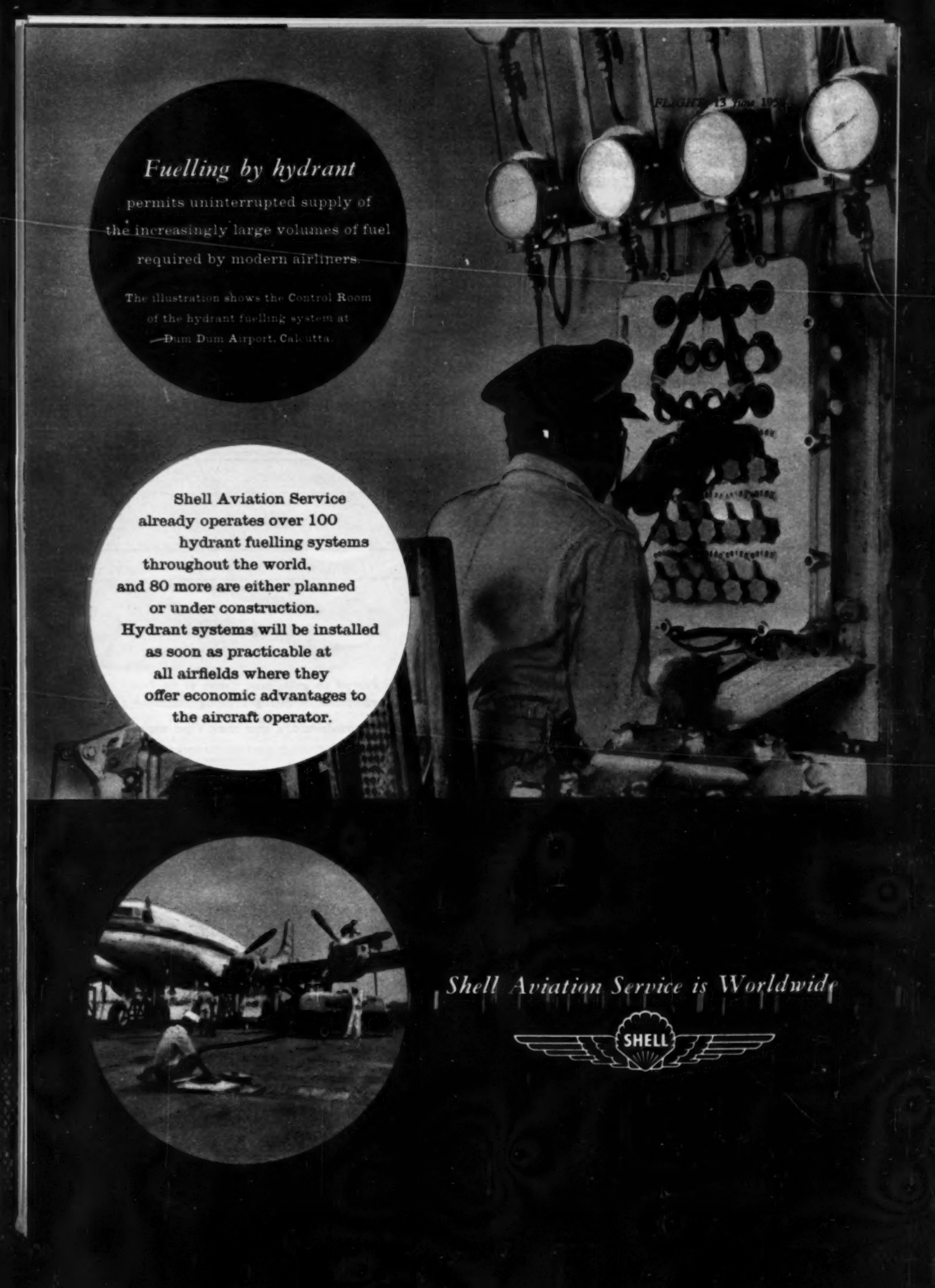
YOUR columnist Roger Bacon thinks that "The only thing you learn from history is that you learn nothing from history" is 99 per cent true.

It is not even one per cent true.

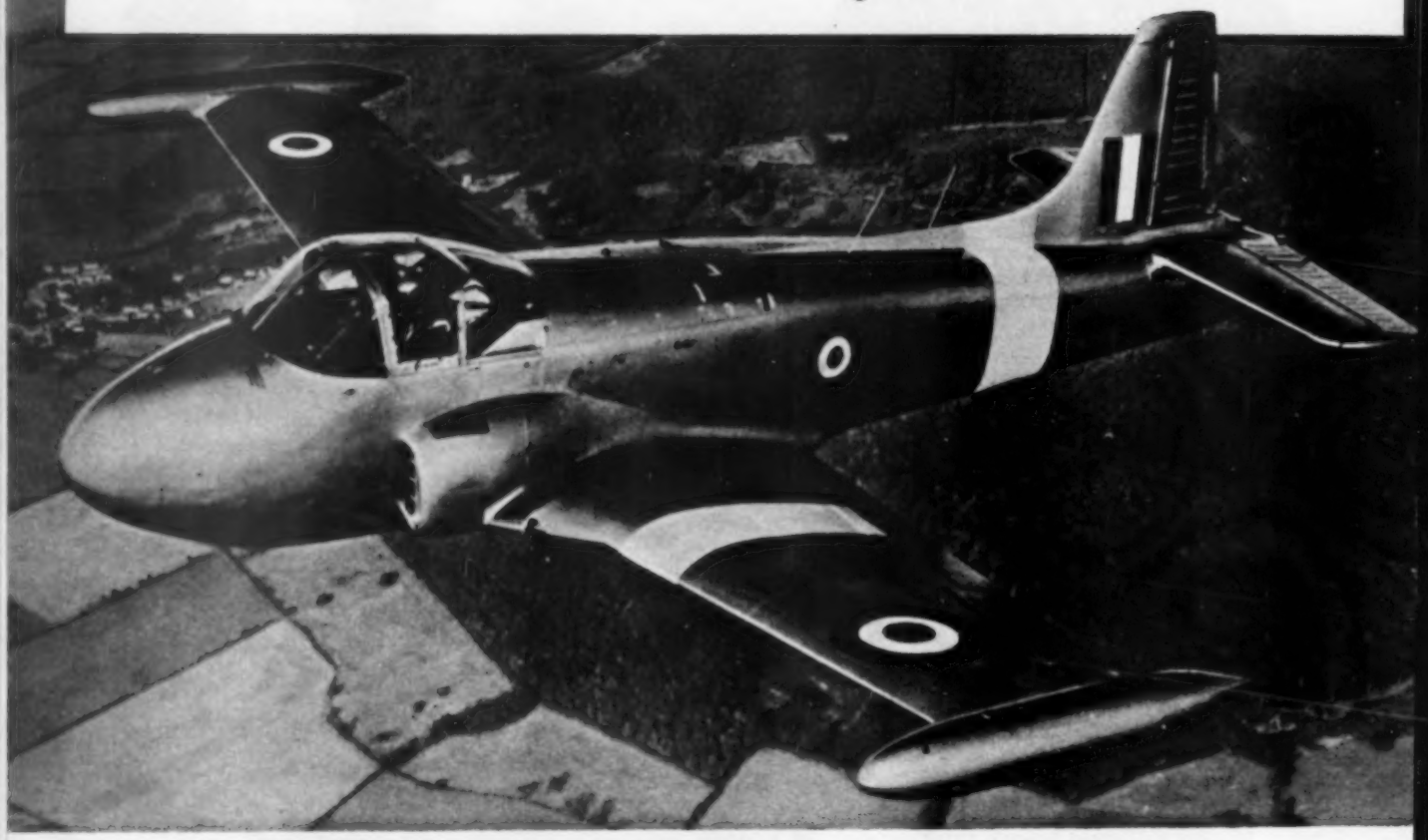
Falkirk, Stirlingshire. A. C. MIDDLEMASS.

FORTHCOMING EVENTS

June 14. Plymouth Aero Club: Air Display.
June 14-15. Popular Flying Association: Rally, Rhoose, Cardiff.
June 15-29. World Gliding Championships, Poland.
June 18. Kronfeld Club: "The Early Days," by F. N. Slingsby.
June 19-28. OSTIV: Seventh Congress, Osieczna, Poland.
June 20-23. Lerida Aero Club: International Tour of Pyrenees.
June 20-23. Palermo Aero Club: Tour of Sicily.
June 21. R.N. Air Station Ford: At Home.
June 22. R.Ae.S.: Garden Party, White Waltham.
June 25. Kronfeld Club: Polish film, "The First Start."
June 27-29. Royal Dutch Aero Club: International Rally.
June 28. Exeter Aero Club: Flying Display, Exeter Airport.
June 28. R.A.F.A. (Cheltenham and Gloucester Branches): Air Display, Staverton Airport.
June 28. R.N. Air Station Abbotsinch: At Home.
June 28-29. Flers Aero Club: Normandy Rally.
June 28-30. R.Ae.C.: Private Air Rally, Le Touquet.
July 4. College of Aeronautics Students' Society: Presentation Ball, Cranfield.
July 5. NATO Air Display: Soesterberg, Holland.
July 5-6. Aéro Club de l'Ouest: Anjou Wines Rally.
July 5-7. R.Ae.C.: Private Air Rally, Deauville.
July 8. Kronfeld Club: Welcome home to British gliding team.
July 8-11. Institute of the Aeronautical Sciences: National Summer Meeting, Los Angeles, Cal.
July 10-12. R.Ae.C.: National Air Races and Lockheed International Aerobatic Competition, Baginton.
July 12-14. Royal Dutch Aero Club: Camping Rally.
July 13. Wolverhampton Aero Club: At Home, Wolverhampton.
July 13. Leicestershire Aero Club: At Home, Leicester East.
July 16. Kronfeld Club: "The London Gliding Club," by Dudley Hiscox.
July 19. R.N. Air Stations Eglington and Culdrose: At Homes.
July 19-20. Calvados Aéro Club: Caen Rally.
July 26. R.N. Air Station Lossiemouth: At Home.
July 26-27. Trento and Bolzano Aero Clubs: Dolomites Circuit.
July 26-Aug. 4. B.G.A.: National Soaring Week.
Aug. 1-16. Czech Aero Club: World Parachute Championship, Bratislava.
Aug. 2. R.N. Air Station Brawdy: At Home.
Aug. 2-4. Plymouth Aero Club: Rally.
Aug. 2-5. S.M.A.E.: Model Aircraft World Championships, College of Aeronautics, Cranfield.
Sept. 1-7. S.B.A.C. Display and Exhibition, Farnborough.


Fuelling by hydrant
permits uninterrupted supply of the increasingly large volumes of fuel required by modern airliners.
The illustration shows the Control Room of the hydrant fuelling system at Dum Dum Airport, Calcutta.
Shell Aviation Service already operates over 100 hydrant fuelling systems throughout the world, and 80 more are either planned or under construction. Hydrant systems will be installed as soon as practicable at all airfields where they offer economic advantages to the aircraft operator.
Shell Aviation Service is Worldwide
SHELL

In service with the Royal Air Force



Two years service with the Royal Air Force has established the Jet Provost ab initio/basic trainer as the best aircraft for its purpose, and the Mk3 is now in production for the re-equipment of Flying Training Command.

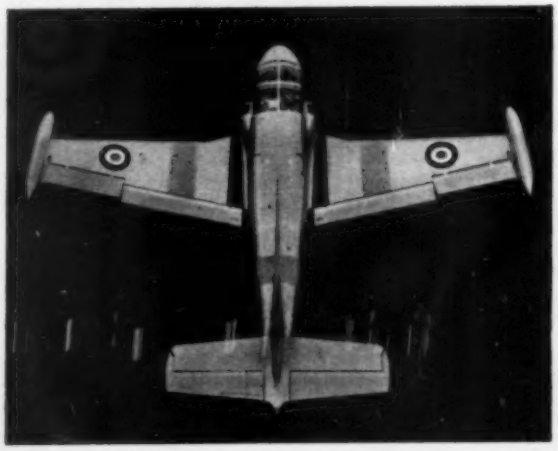
Improvements over the Mk1 include a redesigned undercarriage and windshield, a later mark Viper engine of increased power, increased fuel capacity and the installation of ejection seats.

Jet Provost

Powered by one Armstrong Siddeley Viper Turbo-jet.

The Jet Provost can be supplied to overseas air forces with or without ejection seats and can also be equipped with armament—machine guns, bombs and rockets—for use as a weapons trainer or as a tactical weapon.

Take-off distance, to clear a 50′ (15 m) obstacle...1990′ (606 m)
Climb:
Sea level to 10,000′ (3048 m) ... ... 5.0 mins.
Sea level to 30,000′ (9144 m) ... ... 23.0 mins.
Rate of climb at sea level ... ... 2380 ft./min. (12.2 m/sec.)
Max. level speed at 30,000′ (9144 m)...286 knots (530 km/hr)
Range (with tip tanks) ... ... 490 n. miles (910 km)
Endurance ... ... 2.45 hrs.



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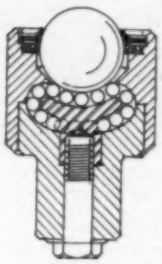
AP369

After a period in the training school, Dunlop apprentices (see news item below) enter the service school, where Service and civil personnel receive training in stripping, fitting and maintenance of aircraft equipment. Seen here is Christopher Cooke, a first-year apprentice engineering draughtsman.

THE INDUSTRY

Low-friction Load-carrying

WELL known as manufacturers of castors, trollies and associated equipment, Autoset (Production), Ltd., of Stour Street, Birmingham, 18, have recently evolved an ingenious friction-reducing device for use in conveyor systems and similar applications. It is, in effect, a large-diameter ball which can revolve freely under extremely heavy loads.



The Autoset device in section. The central table is entirely surrounded by small balls, which can circulate across it in any direction.

The principle is illustrated in the accompanying sectional drawing. The load-carrying ball—typically of 1in diameter—is retained by washers and nylon and felt seals in a mild-steel cup. It rotates against a number of smaller balls (e.g., of $\frac{5}{32}$ in diameter) which recirculate over and under a concave-convex table contained within the cup.

In the course of development tests, state the makers, four of the devices were mounted in a floor frame and a cast-iron plate placed upon them and loaded to a weight of 8 cwt. It was found that friction was so low that the load could be moved with ease in any direction by finger pressure on the edge of the plate.

The system—which is the subject of a world-patent application—can also utilize a main-load roller instead of a ball, though in this case only uni-directional motion is possible unless a tapered roller is used. Fittings to carry loads of 300 lb, 700 lb and one ton are now in course of production.

Dunlop Apprentice Training

CATERING at present for 180 apprentices at Coventry and a further 20 at Dudley, the Dunlop apprentice training scheme is now to be extended to include many more entrants of "A" level and above. Approximately two-thirds of the apprentices—most of whom come direct from school between the ages of 15 and 16—are from secondary modern schools, and about a seventh from public schools, though no formal distinction is made. Selection is by interview and tests, evidence of practical interest being looked for; in the case of boys over 16 the possession of a good G.C.E. at "O" level is expected and at "A" level in appropriate science subjects for boys of 18. Except in the case of graduates and others with high academic attainments, for whom special arrangements are made, the course lasts five years; and by the end of it the trainee will have received a thorough grounding in mechanical engineering and specialized in some particular activity, such as draughtsman or metallurgist. He will also usually have obtained a qualification such as the Higher or Ordinary National Certificate and City and Guilds Final or Intermediate in machine shop engineering.

C.J.C. Policy Change

A CHANGE of policy has been announced by C.J.C. Developments (Portsmouth), Ltd., who as from March 31 have joined a small group of which Cope, Allman and Co., Ltd., of Birmingham, is the main company. C.J.C., who specialize in machining high-tensile steels and high-strength aluminium alloys, remain a private limited company—with the same board and no additional directors—within a public liability company. The change in policy has been effected "in order to consolidate the financial background and to enable C.J.C. to expand and to quote in the commercial market, having the additional support of the group."

Plastics Vade-mecum

THIS year's edition of the *British Plastics Year Book** has been thoroughly revised and is now divided into eight sections. Three are devoted to classified lists of manufacturers and suppliers of materials, finished products and equipment; a fourth contains the world's largest list of trade and proprietary names connected with the industry, covering materials as well as finished goods; the names and addresses section lists nearly 4,000 firms associated with plastics (grouped under countries); there is a Who's Who of the industry; the review of patents issued during the previous year has again been included; and a new feature is a set of tables, giving comparative properties of plastics materials.

**British Plastics Year Book 1958: A Classified Guide to the Plastics Industry*. Iliffe and Sons, Ltd., Dorset House, Stamford Street, London, S.E.1, 42s (postage 1s 9d).

IN BRIEF

Mr. M. H. Tarbitt has resigned his appointment as contracts manager of the research and engineering division of E.M.I. Electronics, Ltd., in order to join Andec, Ltd., Bennet Road, Reading, as commercial manager. Before going to E.M.I., Ltd., in 1949, Mr. Tarbitt held a commission in the Essex Regiment.

* * *

Mr. L. A. Fullagar, one of the technical directors of McLellan and Partners, consulting engineers, retired recently after having been associated with the firm for 34 years. Two senior members, Mr. P. F. Grove and Mr. J. V. Peacock, have been appointed technical directors.

* * *

The British Aluminium Co., Ltd., announces that Mr. J. W. Bennett, lately president of Atomic Energy of Canada, Ltd., has been appointed general manager of the Canadian British Aluminium Co., Ltd., in succession to Mr. P. T. Ensor, M.B.E., who is returning to the United Kingdom in July to take up other duties with the British Aluminium Co., Ltd.

* * *

Speaking at the a.g.m. of British Timken, Ltd., on May 29, Sir John Pascoe (chairman and managing director) said that the turnover in special bearings supplied to the aircraft and associated industries by Fischer Bearings Co., Ltd.—the company's main subsidiary—had been appreciably higher than in the previous year. He added that this market was at present "in a state of some uncertainty owing to the transitional stage through which the aircraft industry is passing."

A major portion of the cabling in the Blackburn NA.39 has been supplied by British Insulated Callender's Cables, Ltd. Some of the cables are standard aircraft types while others have been specially developed, including high-temperature cables and sub-miniature multi-core cables for the electronic equipment.

To be contracts manager for Flight Refuelling, Ltd., from July 1, Mr. Charles Greensmith, A.F.R.Ae.S., will assist Mr. Michael Cobham, who has to date combined the duties of commercial director with those of contracts manager. Formerly publications and advertising manager, Mr. Greensmith will continue to be responsible for advertising.

A booklet entitled *Noral Stress-relieved Plate* has been published by the Northern Aluminium Co., Ltd., Banbury, Oxon, as a guide to the thick, high-strength stress-relieved aluminium alloy plate now being made by the company for the aircraft industry. The publication provides designers with information on properties, sizes, manufacturing tolerances and inspection standards.

SERVICE AVIATION

Royal Air Forces and Naval Flying News

Aden Tests

A SERIES of tropical evaluation trials of the Folland Gnat, Hawker Hunter and Hunting Jet Provost is shortly to be held by the R.A.F. at Aden. An announcement that such tests were contemplated was made by A.V-M. W. H. Kyle, A.C.A.S. (Operational Requirements), when he spoke on future equipment at the R.A.F. conference "Prospect Two" last month. He said then that while it had become almost a tradition for fighter aircraft well tried in the U.K. to be used for ground attack, defence and tactical reconnaissance needs overseas, modern high performance intercepters were becoming less suitable for this general-purpose rôle. What was needed was something "simpler, more versatile and more economical." The aircraft on trial will probably be flown by Service pilots.

Senior Appointments

SINCE October 1955 S.A.S.O. at Bomber Command H.Q. and prior to that A.O.C. British Forces, Aden, A.V-M. S. O. Bufton is to become A.C.A.S. (Intelligence) in August in succession to A.V-M. W. M. L. MacDonald; and he will be succeeded this month as S.A.S.O. at Bomber Command by A. Cdre. J. G. Davis, Director of Plans at the Air Ministry, who is to be an acting air vice-marshal in his new post.

A.V-M. Bufton was successively Deputy Chief of Staff (Operations and Plans) at H.Q., Air Forces Western Europe (now AAFCE); Director of Weapons, Air Ministry; and A.O.A. Bomber Command before his Aden appointment. Among his wartime posts were the command of Nos. 10 and 76 Sqns. and of R.A.F. Pocklington. He was awarded the D.F.C. in November 1940 and appointed C.B. in January 1945.

A. Cdre. Davis became Director of Plans at the Air Ministry in August 1955, after completing an Imperial Defence College course. During the war he commanded No. 269 Sqn. and subsequently R.A.F. stations Lagens (in the Azores) and St. Eval, Cornwall. He was made O.B.E. in 1945 and appointed a C.B. in 1953.

Sunderlands' Retirement

A CHAPTER in the Far East history of the R.A.F. is closing with the retirement of the Sunderlands of No. 205/209 Sqn. (the last R.A.F. unit to use them) and their replacement by Shackletons, the first of which reached Singapore last month; for it was at Seletar, where the squadron is at present based, that the first F.E.A.F. unit—No. 205 Sqn., equipped with Supermarine Southamptons—was formed in January 1929 from the original Far East Flight.

No. 205 Sqn. was subsequently equipped with Singapores, then with Catalinas and (in 1945) with Sunderlands. Its "other half," No. 209 Sqn., has two distinctions in its history—the shooting-down by one of its Camels in 1918 of Von Richthofen, and in 1941 the shadowing by one of its Catalinas of the doomed *Bismarck*.

The Sunderlands of No. 205/209 Sqn. first flew in October 1937. The first of the Shackletons which are to replace them was flown out to Singapore by the squadron's present C.O., W/C. R. A. N. McCready.

M.E.A.F. Post

FROM next month A. Cdre. C. S. Moore, who has been a Director of Intelligence at Air Ministry since August 1955, becomes A.O.A. at H.Q., M.E.A.F.

Air Chief Marshal Sir Walter L. Dawson, Air Member for Supply and Organization, talks with a cadet at the annual review of the Durham County Wing A.T.C. at R.A.F. Middleton St. George on June 1.

Being let down gently from a F.A.A. Whirlwind on to the deck of the frigate H.M.S. "Grenville" is the Minister of Defence, Mr. Duncan Sandys, during his recent visit to Portland to see demonstrations of submarine and A.S. warfare in the Channel.

This will be his third Middle East tour, for from 1932 until mid-1934 he flew with and was adjutant of No. 45 Sqn. in that theatre; and in late 1936 he returned there for flying instructor and air navigator duties with No. 4 F.T.S., remaining in the M.E. until early 1943 and in 1941-42 commanding R.A.F. Port Sudan and the Red Sea hill station, Summit, both of which were concerned with the assembly and despatch of aircraft for the Western Desert. A. Cdre. Moore, who is an O.B.E., was formerly A.O.C. No. 66 (Scottish) Group.

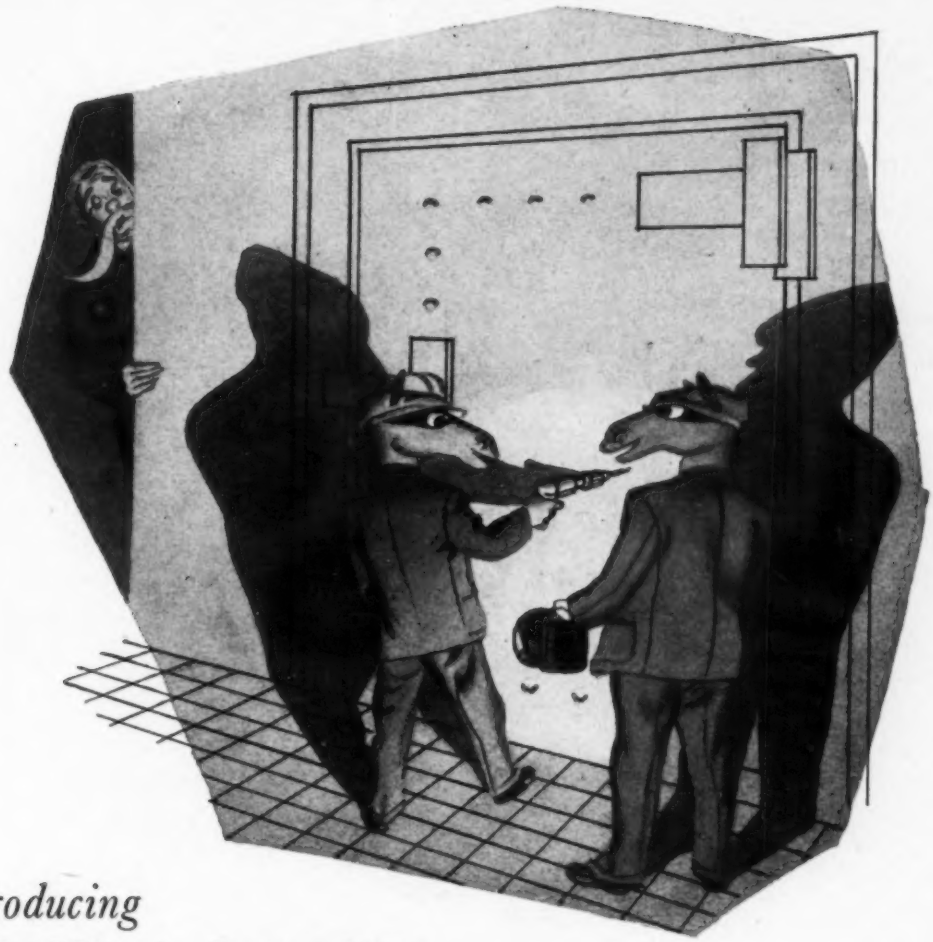
R.A.F. Postings

AMONG appointments recently announced by the Air Ministry are the following:—.

W/C.s E. A. Cox to R.A.F. Wattisham, for technical duties; S. A. Fentum to H.Q. No. 24 Group, for technical staff duties; F. R. Flynn to H.Q., Flying Training Command, for accident prevention duties; E. D. Green to the Air Ministry, for duty in the Department of the C.A.S.; B. J. Jennings to R.A.F. Cardington Balloon Unit, to command; F. N. Shuttleworth to the R.A.F. Hospital, Halton, as specialist in ophthalmology; D. C. Smythe to the U.K. Service Liaison Staff, for Air Staff Training duties in Canada; A. Cross to the Ministry of Supply; W. J. Evans to H.Q., Fighter Command, for administrative staff duties; R. V. Fiddick to H.Q., Fighter Command, for technical staff duties; S. Robinson to the Air Ministry, for duty in the Department of the Air Member for Supply and Organization; S. R. Walton to the Air Ministry, for duty in the Department of the C.A.S.

S/L.s E. A. Challis to R.A.F. Cosford, for administrative duties (with acting rank of wing commander); F. S. R. Johnson to the R.A.F. Staff College, Andover, for directing staff duties (with acting rank of wing commander); J. R. Saunders to R.A.F. Luqa, to command No. 38 Sqn. (with acting rank of wing commander).

An R.C.A.F. Lancaster with a Ryan Firebee under its wing at the Naval Auxiliary Air Station, Brown Field, Cal, where tests confirmed the feasibility of using Lancasters as launchers for these drones—which are to be used by the R.C.A.F. in the evaluation of weapons systems.



Introducing

'Raffles' Desoutter

People who make safes do so with the idea of frustrating burglars who want to bore their way in. Aircraft Designers appear to have much the same intention towards the long-suffering engineers who have to make and assemble their designs. Take Titanium for instance. (All right, *don't* take it! But if you have to drill holes in an Aircraft Factory you have no choice). Normal high speed power tools work themselves and their operators into a state of great heat, blunt edges and even blunter words. Enter 'Raffles' Desoutter, the Little Horse who works at speeds from 160 to 300 r.p.m. and will bore his way into the Bank of England. He is available in an increasing range of Desoutter Tools.

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R141/3 Corner Drill for close quarter reaming 300 r.p.m.
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Rackfeed Drill (specially adapted for reaming) . 200 r.p.m.

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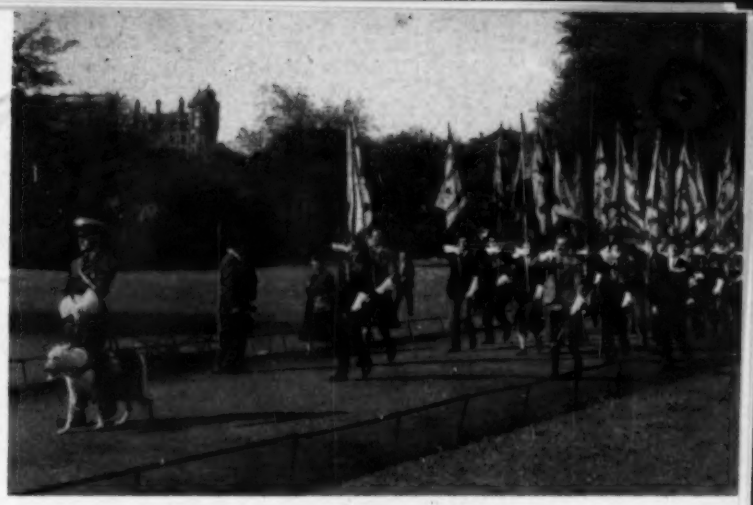
SERVICE AVIATION . . .

R.A.F.A. CONFERENCE



R.A.F.A. Standard-bearers marching to the memorial service held during the Association's conference. At their head is Air Dog "Comet," leader of the R.A.F. Police dog team and an honorary life-member of the R.A.F.A.

THIS year's Royal Air Forces Association annual conference was held in Edinburgh on May 31-June 1. It was the second time the Association had met in the Scottish capital, the last occasion being 1947.

Over 1,700 delegates and visitors attended to represent home and overseas branches, and 170 branch Standards were paraded at the memorial service held in West Princes Street Gardens on the Sunday morning. This was one of the most spectacular settings this ceremony has ever had, with the grey castle towering over the sunlit and colourful gardens where the Standards dipped to the memory of comrades who had died in their country's service.

On May 31, under the chairmanship of Marshal of the R.A.F. Lord Tedder, president of the Association, delegates gathered at the Usher Hall to discuss resolutions on pensions, welfare and other subjects of concern to Service and ex-Service personnel.

In his speech of welcome, Lord Provost Ian A. Johnson-Gilbert, who served in the R.F.C. as a pilot, expressed particular pleasure at welcoming the R.A.F.A. He said the spirit of comradeship was a living force within the Association, which was playing an active part in service to comrades and their dependants, and that the value and importance of the organization were recognized and admired everywhere.

The occasion was a special one for the Lord Provost. Before the opening of the conference he had had an unexpected reunion with two ex-R.F.C. comrades who served on the same station in 1917—Air Chief Marshal Sir John Baker, vice-president of the Association (who had flown from Canada to attend), and Mr. T. Brockley, a member of the Edinburgh branch.

The first resolutions on the agenda concerned pensions and all were passed unanimously. Delegates agreed to a National Council resolution expressing appreciation of the Government's action in granting the largest single increase in the basic rate of pension so far conceded. At the same time, the resolution added, the Conference noted with regret that the full claims of the ex-Service organizations had not been met, and urged the Government to make the further increase required to restore the basic rate to its pre-1939 value. It was also agreed that the Association should intensify efforts to secure an increase in the basic rate for 100 per cent disability pension in order to bring it more into line with average current wages.

The terms of the new Rent Act caused considerable discussion, but the Association eventually adopted a motion from Teignmouth and Dawlish branch that representations be made to the British Legion for the maximum figure for house purchase loans to be raised from £150 to £250. This was urged in view of difficulties being experienced by ex-Service men and women as a result of the Rent Act.

The conference approved by overwhelming majorities two resolutions dealing with disabled persons who drive motor vehicles. The first instructed the National Council to ask the Government to allow disabled ex-Service personnel to buy tax-free petrol for specially adapted cars or tricycles supplied by the Government. It asked that the concession should be given also to the badly disabled whose cars had been specially adapted. A resolution was adopted urging that disabled drivers should be exempt from parking-meter charges.

One resolution which gave rise to keen discussion asked that the Association should impress on the Air Ministry the importance of giving priority to former R.A.F. and W.R.A.F. personnel when filling vacancies at Air Ministry or R.A.F. establishments. This was eventually carried—Mr. Owens (Tottenham) saying his branch felt that this might savour of "jobs for the boys"—by 139 votes to 97.

The conference expressed displeasure with shopkeepers who sell R.A.F. blazer badges to customers who have no right to wear them. Moving a resolution on the subject, Mr. T. D. Baker (Plymouth) said: "Those serving and ex-serving R.A.F. types who are entitled to wear the blazer badge depicting their squadron and command crest wear it in a befitting manner. But what of the person who has never served in the R.A.F., let alone with a squadron, and who, because he wishes to enhance his blazer with a posh-looking badge, dares to walk into a shop and order just what he fancies?"

Badges and Berets

Subsequently members approved the resolution which deplored the illegal wearing of badges, and urged the Air Council to "take immediate steps to confine the sale of such badges by retailers to those persons authorised to wear them."

Delegates discussed a move to scrap the wearing of the beret by Standard-bearers on ceremonial occasions. A resolution from Wimbledon urged that it be discarded in favour of the field service type of cap, which they considered more applicable and more easily recognizable as appertaining to the R.A.F. One of the champions of the beret was Miss Joan Gundry (Clacton) who declared that the wearing of a forage cap on ceremonial parades could prove an additional hazard for the Standard bearer. Concentration was needed to control the Standards, without having to worry about one's headgear becoming airborne. The resolution was carried despite the fact that delegates were told that the change would mean purchase of new headgear.

A resolution proposed by Mr. Baker (Plymouth) asked that when an officer, airman or airwoman died while serving overseas, except during a major operation of war, the body should, subject to the wishes of the family, be brought back to the U.K. for burial, all expenses to be borne from public funds. Mr. A. W. H. Dyer (Downham Market), who seconded, told the delegates that in the case where a Serviceman had died in Cyprus the cost to his parents of bringing the body home had been £400.

The resolution was opposed by Dame Helen Gwynne-Vaughan, life vice-president of the Association, who said she did not think it was right to exhume bodies and transport them long distances and that it was more seemly for the bodies to rest where they had fallen. Delegates rejected the proposal.

Later they adopted a resolution asking the Government to consider improvements in the Service pensions paid to dependants of Regular officers and airmen, particularly to the widows of "other ranks."

Air Marshal Sir Harold Lydford was elected chairman of the National Council in succession to Air Marshal Sir Robert Saundby, who had held this office for 12½ years. Sir Robert was unanimously elected a life vice-president. Tribute was paid to his wisdom, patient guidance and leadership—which had brought the Association so far on the road to success, enjoying a prestige of which it is very proud—and to the way in which he had seen and helped along the spirit of good fellowship within the organization. The National Council, delegates and Association staff rose to acclaim their popular ex-chairman and express pleasure at his "remaining on the strength" as a vice-president.

The conference also paid tribute to another greatly respected ex-member of the National Council, G/C. R. C. Vaughan, who had served the Association since 1945 and held office as chairman of both the National Executive Committee and the Law Sub-Committee. He unfortunately had had to retire owing to ill health.

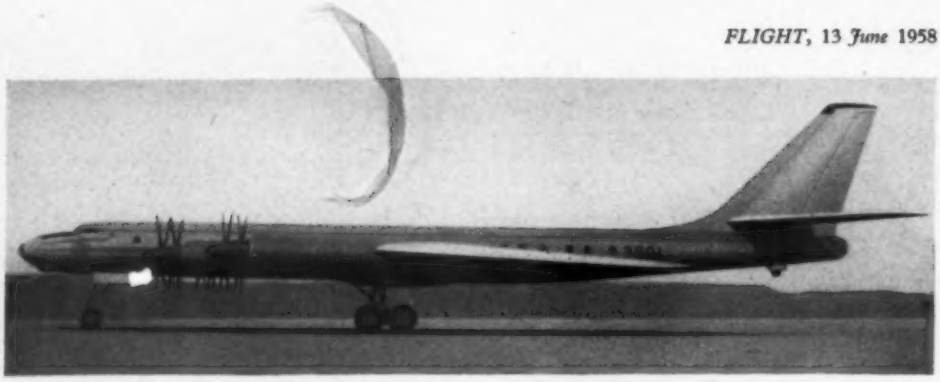
The new chairman of the Executive Commmittee is Dame Helen Gwynne-Vaughan.

R.O.C. Jubilee

SOME 300 members of No. 5 (Watford) Group of the Royal Observer Corps attended a dinner in the Queen's Building restaurant at London Airport last Saturday, June 7, to celebrate the silver jubilee of the Group's formation in 1933. No more appropriate place could have been chosen, because the Airport is within No. 5 Group's area of responsibility, whilst its present Commandant, Obs. Cdr. G. A. D. Bourne, is both R.O.C. liaison officer at L.A.P. and manager of Barclay's Bank there.

The toast to the R.O.C. was proposed by the Airport Commandant, G/C. G. J. H. Jeffs, who said he was an old friend of the Corps, having been a controller at Fighter Command H.Q. before and during the Battle of Britain. He added that he would always be pleased to welcome official parties of Observers at the airport and let them see the radar rooms and other places not normally opened to the public.

Other guests included Obs. Capt. W. Rusby, Deputy Commandant of the Corps; Obs. Capt. B. Parks, Commandant Metropolitan Area; and the Commandants of Nos. 1, 2 and 4 Groups.



Displaying a very close similarity to the "Bear" bomber, the Tu-114D variant of the big Tu-114 turboprop has a considerably more slender fuselage. According to its designer, A. N. Tupolev—and as recent flights suggest—it is intended to carry a small number of passengers, mail and urgent freight over very long distances.

CIVIL AVIATION

LONG-RANGE BRITANNIAS TO AFRICA

B.O.A.C. feels confident that by mid-summer its North Atlantic fleet will be up to full strength—in relation, that is, to expected traffic—and that a few long-range Britannias can then be spared to take over the services to Central and South Africa, at present being flown by Britannia 102s and Argonauts.

The first Britannia 312 service will link London and Johannesburg, the initial flight taking place on July 27. Southbound elapsed time will be 22 hr 15 min, the northward journey taking an additional 25 min. The normal routeing will be *via* Rome, Khartoum, Nairobi and Salisbury. (Certain flights will overfly the Rhodesian capital, cutting the journey-time by an hour.) Compared with the Britannia 100s already operating to Johannesburg, the long-range Britannia is scheduled to save about an hour in each direction. As regards capacity, with a configuration showing 20 first-class and 54 tourist-class seats, the 312s will only cater for six more (tourist) passengers than the 102s. Frequency on this route will be unchanged at four round flights each week.

On July 31 the long-range Britannias will take over the twice-weekly service that terminates at Salisbury. At present this is being operated by Argonauts in C.A.A.C. livery. By virtue of its higher cruising speed, and by avoiding Benghazi, Entebbe, Ndola and Lusaka, the 312—also under charter to Central African Airways—will reduce elapsed time by as much as 10½ hours—a saving of one-third on current schedules.

B.O.A.C. and E.A.A.C. services between London and East Africa will continue to use Argonauts, while B.O.A.C. and W.A.A.C. routes to Africa's west coast will be served by Stratocruisers at least until next year.

FLYING OVER TERRITORIAL WATERS

ALREADY the effects of the recent Geneva conference on extension of territorial waters are starting to be felt in the air transport world. In one way this extension of sovereignty is likely to promote civil aviation activities: whereas a three-mile limit allows a considerable amount of patrol work to be conducted conveniently from the shore, a twelve-mile limit provides greater scope for use of aircraft. It has already been reported that the Irish Government may review its policy towards the use of helicopters for fishery-protection duties round the coasts of the Republic. Other countries such as Iceland and Norway might also find increased possibilities for this sort of operation. An extension of sovereignty would not only be felt in the fishing industry, but in other off-shore activities such as oil-exploration and development, the helicopter already being widely used in this field, particularly in the Gulf of Mexico.

In another respect any extension of territorial waters could act to the detriment of air transport. Governments will have as much control over these waters as over their land surfaces and so their power to withhold "first freedom" rights (i.e., overflying a foreign territory) will be correspondingly increased. Where a nation comprises scattered islands—Indonesia is an example—it would be possible to inflict a severe hardship on airlines flying an unpopular flag. The problems of small enclave territories hedged around by unco-operative neighbours could also be heightened by the developments at Geneva. Air services in and out of Goa have for some years been prejudiced by the restrictions enforced by the Indian Government. The Baltic, the Adriatic and the Eastern Mediterranean are other obvious zones of potential difficulty. Large, intercontinental carriers using long-range equipment are less affected by these diversions than airlines such as Goa's T.A.I.P.

MAKING SPARES PROVISIONING WORK

IT has never been easy for aircraft firms new to the modern air transport business to appreciate just how much after-sales effort is needed to achieve commercial success. Concerns as firmly established in the field as Vickers-Armstrongs, whose admirable operators' annual conference was reviewed on these pages last week (see photograph below), appreciate the need for an exceptional degree of customer co-operation, and Armstrong Whitworth, who are taking this aspect of the AW.650 Freightercoach and AW.670 Car Ferry very seriously indeed, are proving quick to follow up with ideas of their own.

The firm have inaugurated a new department with responsibility under the service manager for spares provisioning, handling and ordering. It is claimed to be the first of its kind in Britain. The aim is to present to the customer adequate information in easily understood form and to maintain an off-the-shelf spares service for his use. A.W.A. intend to use the ten aircraft that are being built for flight trials and as demonstrators as a private fleet with which to assess spares provisioning needs some time before the first aircraft are delivered.

The provisioning system has been designed with the small operator very much in mind. Punched-card facilities and complex spares systems to A.T.A. 200 standard will be available, but are not envisaged as being required from the outset.

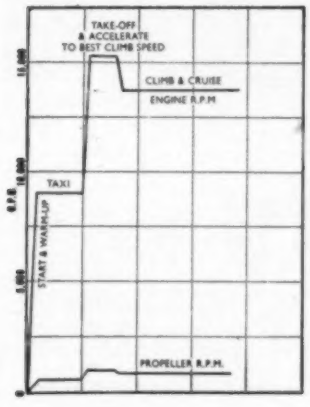
For spares purposes, all components of the aircraft have been divided into one of three categories, depending upon the rate at which they are likely to be used. High-turnover spares such as tyres and brakes are classified with a pink card, normal-usage items with yellow, and certain structural parts liable only to accidental damage with green. All cards are filed for reference in part-number sequence, and it is intended to provide each customer with microfilmed drawings.

A.W.A. engineers and the airline's planning staff will decide the spares requirements for the particular aircraft variant and the manufacturer's service department will hold a master set of spares cards. The information which the cards contain includes a cross-reference to the part to which it refers, together with recommended stock quantities based on the airline's estimated flying hours and modification information. When new spares are ordered the spares provisioning department can cross-check to confirm validity, and assessing engineers will be responsible for keeping both the manufacturer's and customer's index fully up-to-date; for example, a new set of complimentary provisioning cards will be sent to the airline whenever a modification leaflet is issued.

Gathered together at Weybridge last week to discuss their common problems with Vickers, are seen engineers from 33 of the world's Viscount operators. Present at the opening by Sir George Edwards were the German Ambassador and Federal German Transport Minister.

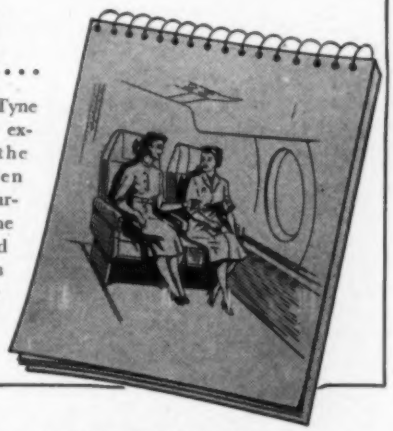
Yes, with the VANGUARD

The many problems of noise nuisance on and around airfields will be reduced by the introduction of the Vickers Vanguard. Noise from the four Rolls-Royce Tyne propeller-turbines is remarkably low for an aircraft of the Vanguard's size and power. This will be of particular advantage when operating from airfields in or near residential areas. A lower noise level on the airport will also increase efficiency in the administrative blocks and improve the broadcasting of passenger information. The lower interior noise and vibration will win approval from operators, pilots and passengers.



For your notebook...

Gases from the Tyne engines are only exhausted after the power has been absorbed by the turbine. This is one reason for reduced noise. The other is the low propeller tip speed.



VICKERS VANGUARD

FOUR ROLLS-ROYCE TYNE PROPELLER-TURBINE ENGINES

VICKERS-ARMSTRONGS (AIRCRAFT) LIMITED WEYBRIDGE SURREY

TGA AT541

IGY2

It's dazzling when you look up!

It's hard to look the sun in the eye. Just as it's hard to contemplate the possibility of flight into Space. Yet the possibility, like the sun, is clearly there. Will it be realised in our children's lifetime, or theirs? Nothing is certain. But the promise of this International Geophysical Year is that it will bring such an achievement appreciably closer.

AVIATION BP SERVICE

The international aircraft fuelling organisation of
The British Petroleum Company Limited

salutes the I.G.Y.—year of opportunity

Gatwick Airport was formally opened by the Queen last Monday, June 9 (see page 790). A number of airline captains who formed a guard of honour were presented to Her Majesty. Here Capt. P. J. McKeown of B.E.A. introduces Capt. A. Spencer of Jersey Airlines.

CIVIL AVIATION . . .

SABENA TO MOSCOW

BETWEEN May 15 and May 19 (a special correspondent writes) an agreement was concluded between Belgium and Russia that led to the first Sabena service to Moscow being inaugurated on June 2. The Belgian airline used a DC-7C, the flight from Melsbroek taking 5½ hr. The frequency of the Sabena service will initially be once a week, but this will be increased to two per week on July 31. Weekly flights by Aeroflot Tu-104s to Belgium started on June 6: this frequency will also be stepped up later in the summer. Last year 15,000 Russians—many of them tourists—are reported to have visited the West.

HERONS MIGRATING

THE management of Indian Airlines Corporation is reported to be anxious to dispose of its two-year-old fleet of eight Herons on the grounds that these aircraft have proved to be "uneconomical."

In reply to a parliamentary question on I.A.C.'s plans, the Deputy Minister for Civil Aviation, Mr. Ahmed Mohiuddin, explained that operational costs for the Herons had been found to be high, and although this had been realized at the time of their purchase, it was hoped that their four-engined appeal would permit high load-factors to be achieved. Unfortunately, Mr. Mohuiddin continued, traffic had not been forthcoming as expected. One of the Herons has already been sold.

I.A.C. thus appear to be in the same position as Garuda. With 13 Herons the Indonesian national carrier has the world's largest fleet of these aircraft. However, this airline has recently put DC-3s and Convairs on to all its services, international and domestic, and the Herons are presumably awaiting disposal.

New Zealand National's fleet of Herons has now been run down from four to one aircraft, and this is soon expected to be sold abroad. The other few Herons in the eastern hemisphere have also been the subjects of change. The three at one time owned by Japan Air Lines and leased to Far Eastern Airlines have now been purchased by All Nippon Airways (successor to Far Eastern and Japan Helicopter). T.A.I.P., operating from Goa, have now only one of the two Herons previously registered under their name, the remaining aircraft not being used on scheduled services. The final change involves Transpac, a small French airline based in New Caledonia, which has recently added a single ex-U.A.T. Heron to the fleet of three Rapides used on feeder-services in and out of Noumea.

It is difficult to pinpoint the reason for these changes. Several of these operators have been achieving high utilization-rates: this is evidence that to a large degree refutes stories of aircraft unreliability and of delays in receiving spares. A more likely reason is the continued growth of air traffic combined with the falling price of used DC-3s and early model Convairs. (The margin between operating cost per aircraft mile for the DC-3 and for the Heron is surprisingly narrow.) On scattered low-density routes the smaller aircraft, while being only slightly cheaper, is considerably more flexible. But as traffic grows on the more important routes, and as larger aircraft become cheaper and more easily available, flexibility tends to become less important a criterion than rationalization of aircraft types or provision of extra capacity.

Changing ownership of these Herons can perhaps be seen as not so much a reflection on the aircraft as on the operator. There appears to be a stage in the development of most airline networks when the Heron is a most suitable aircraft. It is the transitory character of this stage that will probably ensure that the Heron continues to migrate.

In the meantime Heron airline networks include those operated by U.A.T., Jersey Airlines, T.H.Y., Aviaco, Braathens, W.A.A.C., Cambrian, Gulf, Silver City and Bahamas Airways. D.H. production is now mainly for executive owners; there are about 18 such operators of the Heron.

WHO SHOULD STAY AT HOME?

A RECENT issue of *Time* magazine contained an article entitled "International Airlines—Many Should Stay at Home." Opening with the statement that "as every airman knows, there are too many airlines," the article goes on to claim that "at last count no fewer than 200 so-called international airlines were in the air—when possibly half that number could do the job." Favourable comment is reserved for six airlines: K.L.M., Sabena ("both rank among the world's finest airlines"), Japan Air Lines ("has such an effective domestic network that it operates without subsidy"), S.A.S. ("which has enough traffic, capital and competitive know-how to survive"), Qantas ("performs a real economic service as a lifeline"), and Middle East Airlines ("which operates a profitable Viscount service throughout the Arab world—where air traffic increases 30 per cent annually against world increase of 13 per cent—and has no ambition beyond operating as a feeder service").

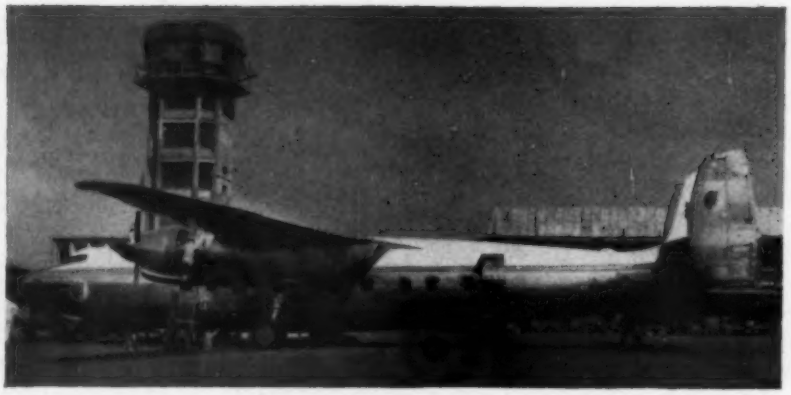
Receiving less favourable notice are three carriers—Saudi Arabian Airlines, Garuda Indonesian Airways and Union of Burma Airways—which allegedly suffer from the problem that "many of the native flyers do not yet have the training for the job." Two others—Thai Airways and Philippine Air Lines—stand accused of "overambition." Examples of the contention that "few newcomers to flying seem to learn from the experience of others" are Aerlinte Eireann ("recently succumbed to the temptation of a transatlantic line even though it could only afford to lease three Super Constellations") and Austrian Airlines ("a line prepared to go anywhere except where it is needed").

Having noted that "no one wants to shoot the small foreign carriers out of the air," the article sets down three possible solutions: (1) that the small airlines "concentrate on regional feeder operations where they can perform a real economic service," (2) that they "merge with others to form one major international unit," (3) that the price of new airliners is becoming so high that small countries will no longer be able to afford an airline.

The increasing number of small airlines is ascribed to the "reciprocal basis" on which "landing rights are awarded."

Airborne over a smog-free Los Angeles on its maiden flight: the Douglas DC-8, of which 138 are now on order. Just visible in the photograph are the Rolls-Royce-designed noise suppressors on the Pratt and Whitney JT3 engines.

CIVIL AVIATION...



B.K.S. Elizabethan Zulu Whiskey at Flesland Airport, Bergen, on its inaugural flight from Woolsington. A new control tower (left) and terminal building are under construction.

B.K.S. Inaugurate a New Service from Newcastle

TO NORWAY TWICE A WEEK

WITH three Ambassadors now on their fleet, the independent operators B.K.S. have acquired enhanced status. Offering modern equipment on their international service is unquestionably giving the airline a competitive boost. The Ambassador operation has presented quite a challenge to B.K.S., and the operational and engineering staffs have tackled the task with enthusiasm. High praise on every hand is forthcoming for B.E.A., who have backed their sale of the three aircraft with the fullest possible technical co-operation. B.K.S. encountered some difficulties with spares provisioning in the early weeks of their operations (B.E.A.'s Viscount 700 spar modifications meant that the Corporation also had an extended call on Elizabethan spares) but with help from de Havilland these are now being resolved.

Elizabethans in B.K.S. service remain substantially unmodified from the form in which they were operated by B.E.A. New colour schemes have been devised (the latest of these is shown in the heading photograph), but the Union Jack on the central fin is retained, and so is the plaid finish of the cabin walls. But major changes have been made to the interior layout so that 55 seats, five-abreast with a central aisle, can be accommodated in place of the 47 first-class or 49 tourist seats with which B.E.A.'s aircraft were equipped. This has been made possible by pruning about 800 lb from the B.E.A. Elizabethan's equipped weight.

Special non-adjustable seats, designed by B.K.S. in association with Aviation Traders and manufactured for them by Flying Services, Ltd., at Chesham, are fitted to the seat rails at a predetermined pitch. The new seats are particularly light—the triple unit weighs only 42 lb—and are more than adequately comfortable for the stage-lengths over which the airline operates. Each seat, which is upholstered in plastic foam covered in washable patterned Vynide, incorporates a folding tray and pocket in the back. This work is the responsibility of Benson Aircraft Upholsterers, Ltd., whose works are adjacent to those of B.K.S. at Southend. A second major weight-saving was achieved by fitting Mallinson bonded L72 sheet and end-grain balsa sandwich floors—an expedient that has already paid dividends on B.K.S.'s DC-3s. The savings achieved make it practical for the aircraft to carry a spares pack on international flights.

The Elizabethan—the Corporation's fleet name is retained by B.K.S.—has been introduced this year on the company's routes from Newcastle to Basle, Dublin and Jersey; Newcastle to Belfast, via Edinburgh; Newcastle - London - Bilbao - Santander and, as from June 4, from Newcastle to Bergen. The routes to Belfast, Bergen, Basle and London are new this year. The London service, which is operated only on Saturdays, is the first revival of a service that was operated daily from Newcastle's Woolsington Airport to L.A.P. by Hunting-Clan Viscounts before it was withdrawn at the end of 1956. It proved popular enough with Tyneside businessmen to warrant a careful exploration of the possibilities of a similar service by B.K.S., but the necessity of devoting one aircraft to one return trip each way a day affords too low a utilization to make the service economical with the present route pattern, and the present Saturday service is incidental to the Newcastle - Bilbao flight. Nevertheless, B.K.S. now have a fleet of sufficient size to give them some capacity to spare, and with suitable routes they estimate that they could find another 1,000 hr work annually for their fleet of three Elizabethans and three DC-3s.

The new B.K.S. service between Newcastle and Bergen is a logical air extension of a popular tourist shipping route, the towns being well connected commercially and sentimentally; a Christmas tree from Bergen is erected in Newcastle every year.

The airline's market research has shown that a useful potential of air traffic exists both in what might be called the greater Tyneside area and in Northern Ireland, and their sales promotion is being directed towards exploiting the idea that Stavanger, Alesund, Oslo and Tønsberg—indeed, most of Norway and much of Scandinavia—can be reached in one day even from Northern Ireland. The airline anticipates some very hard work before making the service into a profitable operation, particularly in this first year, but they are being greatly helped by the genuine enthusiasm and hard work of Braathens S.A.F.E., who are the B.K.S. general agents in Norway. S.A.S. flights from Bergen and the Braathens Luftbuesen air-bus service provide connections northwards to Alesund and Trondheim, eastwards to Oslo and Stockholm and to Stavanger, Kristiansand and Tønsberg. Advertising of the service in Norway is being got under way, and the British Travel and Holidays Association in Scandinavia is also lending energetic support to the venture.

Although scheduled as a summer service, weekly at first, twice weekly on Wednesdays and Fridays from June 20 until September 12, there is a prospect of either a weekly winter Newcastle - Bergen service or a regular charter to winter holidaymakers and ski clubs; there is a confirmed tradition of travel to Scandinavia in the North of England and in Northern Ireland.

B.K.S. are disappointed that—although not members of I.A.T.A.—they had to adopt a fare at I.A.T.A. level on this international route; they would have preferred to offer a fare that was more nearly competitive with the shipping company rates. They do, however, offer a 23-day excursion fare that costs £6 4s less than the normal return fare of £27 15s.

The first inaugural flight to Bergen on June 4 was arranged to demonstrate the possibilities of leaving Northern Ireland at a civilized hour and yet arriving in Norway with plenty of time in hand to make onward connections. Lady Wakehurst, wife of the Governor of Northern Ireland, boarded a B.K.S. Elizabethan in Belfast at 10.30 hr, before joining the deputy Lord Mayor of Newcastle, Councillor Brigadier H. I. Branson, the Earl of Tankerville and his daughter and the remainder of the party at a civic reception by the Lord Mayor of Newcastle at Woolsington Airport. The journey to Bergen, which *Flight* was able to sample, was made in comfortably less time than the scheduled 2½ hr. A Norwegian-speaking stewardess is carried on each flight, on which an English salad lunch or Norwegian smørrebrød is served. Completely without fuss, pomp or untoward incident of any kind, the return flight was made three hours later. The operation has been shown to work very smoothly—now the hard commercial work of bringing in the traffic must begin.

A. T. P.

A saving of 800 lb in equipped weight has made it possible to install 55 seats in the popular high-wing Elizabethan. The B.K.S. motif may in future be used only on alternate head-rest covers.

Icelandair's three DC-3s carry the majority of the airline's internal traffic. Here two of them cross Iceland's indented coastline.

ICELANDAIR

Iceland's Older Airline Celebrates its 21st Birthday

TO be the most air-minded country in the world is a claim often made by Iceland—and it is no idle one; the equivalent of more than half its population of only 160,000 was carried in 1957 by the older of its two national airlines, Flugfélag Islands h.f. (Iceland Airways, Ltd.). Now more commonly known as Icelandair, the company carried a total of 80,504 passengers in 1957 (an increase of 14.44 per cent over 1956), and 59,501 of them flew on the domestic routes which it has operated alone since February 1952. A sparse road-network and a complete lack of railways combine to make air transport a "must" for the people of Iceland, and to meet this need Icelandair was formed twenty-one years ago.

The company was founded on June 3, 1937, as Flugfélag Akureyrar, with headquarters at Akureyri, the major town and fishing port on Iceland's north coast; initially the company's capital was held by a group of Akureyri citizens. In the following April the company acquired its first aircraft, a four-passenger Waco YKS biplane seaplane which was used for charter work to various points around the coast. During the winter of 1939-40 the Waco capsized on taking off from Skerjaffjord and was badly damaged. As a result the company was reorganized in 1940 as Flugfélag Islands h.f., headquarters were moved to Reykjavik, and the capital was increased to Kr.150,000. At present, capital is owned jointly by the Icelandic Steamship Co. (which is the major shareholder), the Government and Icelandic citizens. A second Waco YKS was bought after the move to Reykjavik, and the original Waco was eventually repaired. In the summer of 1940 Flugfélag Islands received a government contract to spot herring shoals for the fishing boats working out of Akureyri. Herring spotting had been done from the air since 1937, being financed by the fishermen on a co-operative basis.

During the war Iceland became a base for British (and later American) forces, for the use of which the country's first aerodromes—in particular Keflavik (Meeks Field) and Reykjavik—were constructed. In 1942 Flugfélag acquired two D.H. Rapides; later on a Beechcraft 18D and a Catalina joined the fleet. The advantages of being able to operate from land as well as water were reflected in a steep rise in traffic. Even in 1938 as many as 770 passengers were carried by the single Waco seaplane, plus a small quantity of freight. This total had increased almost tenfold by 1945, in which year 7,143 passengers were carried. Not many weeks after VE-day Flugfélag's Catalina made the company's first international flights, doing several trips to the U.K. and Denmark. Regular, scheduled services between Reykjavik, Prestwick and Copenhagen began on May 27, 1946, initially using 14-passenger Liberators to Prestwick and 21-passenger Dakotas to Copenhagen; after the first two months 24-passenger Liberators were used all the way. These aircraft were chartered from and flown by Scottish Airlines, Ltd.

On April 10, 1948, Flugfélag's first Skymaster, TF-ISE *Gullfaxi* ("Golden Horse"), was put on to the routes from Reykjavik to Prestwick, Copenhagen and Oslo, and Scottish Airlines ceased to operate these services. The fleet by then consisted of one DC-4, three PBY-5A Cansos, three DC-3s, a Rapide, a Grumman JRF-5 Goose and a Norseman. *Gullfaxi* opened the first direct Iceland - London service on May 3, 1949, flying once a week between Reykjavik and Northolt with a stop at Prestwick; for a time the services to London alternated fortnightly with those of Loftleidir h.f. The year 1955 saw the addition of Frankfurt, Hamburg, Bergen and Stockholm to the route network and the purchase of a second DC-4, TF-IST *Solfaxi* ("Sun Horse"), from Fred Olsen Flyselskap A/S. The first DC-4 was later sold to Africair.

In March 1957 two V.759 Viscounts—which can be fitted with slipper tanks—were acquired from Hunting-Clan, and arrived in Iceland on May 2 last year; they are registered TF-ISN *Gullfaxi* and TF-ISU *Hrimfaxi*. The DC-4 now operates some of the internal routes when traffic is heavy, and the Viscounts have taken over European services. There are five Viscount services a week between Reykjavik, Glasgow and Copenhagen, leaving at 0800 hr and arriving at Copenhagen at 1500. Icelandair has traffic rights between Glasgow and the Danish capital, providing the only direct day service between these two cities. There is a twice-weekly Reykjavik - Oslo - Copenhagen - Hamburg service, the Viscount leaving at 0800 Thursdays and 1000 Saturdays; as from June 29 there will be a third service, leaving at 0800 Mondays.

Loftleidir's DC-4s fly exactly the same route, leaving Iceland's capital at 0945 on Thursdays and returning on Sundays, and Loftleidir operates a similar Reykjavik - Gothenburg - Copenhagen - Hamburg service twice weekly. Icelandair flies the direct Reykjavik - London route on Mondays and Thursdays; the Viscount leaves Iceland at 1000 and arrives at London Airport Central at 1500. Loftleidir's DC-4s fly out on this route on Mondays and back on Tuesdays, stopping at Renfrew.

Icelandair has traffic rights between Oslo, Copenhagen and Hamburg, and its Viscounts compete with S.A.S. Metropolitans and DC-6s between Oslo, Gothenburg and Copenhagen, while between Copenhagen and Hamburg Lufthansa and S.A.S. Seven Seas, DC-6Bs and Metropolitans share traffic with the Viscounts of Icelandair and Eagle Airways. The latter run a Manchester - Hamburg - Copenhagen service on Mondays and Fridays.

Icelandair's Viscounts raised average load-factors from 58.4 per cent to 75.5 per cent and increased the number of passengers carried by 46 per cent in the first four months of their operations. Last July they carried five times as many passengers between Copenhagen and Hamburg as the DC-4s had carried in July 1956, even though frequencies between these points had been increased by some 70 per cent. The increase in passengers carried on European routes during the whole of 1957 was 35.2 per cent over the 1956 total, and Icelandair considers that its Viscounts have given it a great competitive advantage.

Much of Icelandair's traffic is carried on the internal services which connect Reykjavik with 20 towns and villages. A fleet of three DC-3s and two PBY-5A Canso amphibians, as well as the Grumman Goose, fly these services and also undertake ambulance flights, charter work and herring-shoal spotting. As might be expected, passengers on these internal routes come from all walks of life. Fishermen from the north fly south for the cod-fishing season, and north again when the herring season begins (up to three services a day run to Akureyri). Schoolchildren often fly from Reykjavik to various parts of the country to enjoy their holidays working on farms. But perhaps the aeroplane is valued most highly by Iceland's farmers, not only for flying from the farming districts to Reykjavik on business or pleasure, but as a means of getting their produce to market. Such items as tractors, foodstuffs, fuel and building materials are delivered by air for use on the farm, and live sheep have been flown from remote farming districts for resettlement in other parts of the country, this method proving cheaper than surface transport. Icelandair DC-3s have several times dropped foodstuffs and other material to farms cut off by heavy snowfalls. A total of 1,275,000 kg of freight was carried on internal routes last year, an 8.8 per cent increase over 1956.

Icelandair also pays many visits to Greenland, and nearly 400 trips have been made there since 1952 carrying passengers, freight and mail to such places as Thule and Narsarssuak or Bluie West One. Food and supplies have also been dropped by parachute to scientists stationed on the Greenland Ice-cap.

The importance of internal air transport to the community is underlined by the fact that Icelandair has two traffic managers, one for international and one for domestic routes, although the airline's staff totals only about 250 people. But the achievements in the past 21 years certainly justify their neat summing up of Icelandair as "The biggest little airline in the world." M. J. H.

Introduction of Viscounts in 1957 substantially raised the airline's average load factors in the first four months of service.

CIVIL AVIATION . . .

SHELL SELF-SERVICE

THE Shell Petroleum Company, Ltd., has formed a new subsidiary, Shell Aircraft, Ltd., to advise those branches of the parent organization outside North America "on managerial and technical problems" relating to the operation and servicing of aircraft owned or chartered by Shell.

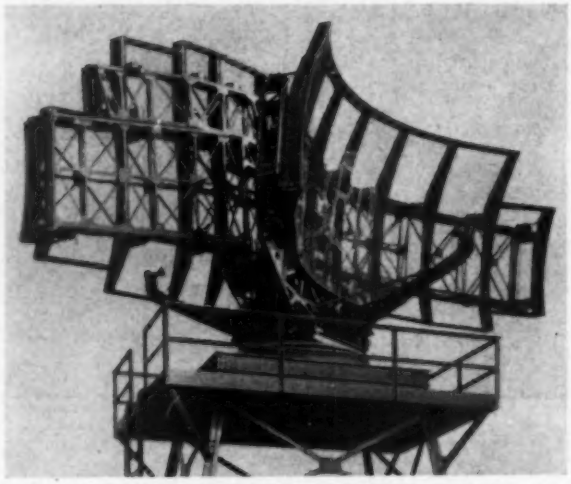
Capital of the new company is £20,000. G/C. Douglas Bader is managing director, and Mr. F. J. Stephens is chairman. Shell's fleet of aircraft numbers 67 (24 owned, 43 leased) with a further four on order (of which three will be chartered). Of the present fleet, helicopters account for 38 aircraft and fixed-wing machines for 29. Among the helicopters are nine S-55s of which seven are chartered (four in Nigeria, two in Borneo, one in Pakistan), the two Shell-owned aircraft being operated in the Persian Gulf. The fixed-wing fleet includes four Herons operating in the U.K. and in Venezuela, five Doves based in Venezuela, Pakistan and the U.K., two Catalinas in New Guinea, three Princes and two Sealands in Borneo, four Mallards in Indonesia and New Guinea and four DC-3s in Indonesia, Venezuela, Libya and Algeria.

SWEDEN ORDERS NEW DECCA RADAR

THE Swedish Civil Air Board has placed an order with Decca Radar, Ltd., for two new Decca D.A.S.R.1 air surveillance radars to be set up next year in the Stockholm and Gothenburg areas.

D.A.S.R.1 incorporates several new features, including air target indication, a new method of suppressing ground returns. Two beams are projected from separate S-band, 800 kW transmitters having reflectors mounted back-to-back on the same turning gear. One beam covers high altitudes and shorter ranges, while the other "looks" straight out to 115 miles, completing a solid, gap-free coverage. Targets of 20 sq m equivalent reflecting area can be detected at over 40,000ft and 115 miles; and 3 sq m targets (fighter size) can be detected at 30,000ft and 80 miles. Ground echoes are eliminated by cutting out returns from the low beam at the closer ranges. The use of present complicated and expensive electronic M.T.I. methods with their blind speeds and radial course limitations is thus avoided.

In addition, D.A.S.R.1 has infinitely variable polarization so that rain clutter may be reduced to any level. Aircraft can thus be seen in heavy rain or snow, but also guided round still-visible storm-centres. Data rate is very high, as the aerials rotate at 10 r.p.m.



The two-beam aerial system of the Decca D.A.S.R.1 surveillance radar.

The two signals are superimposed on the same display; and fixed-coil methods are used to superimpose a number of other traces on the tube. Extended runway centrelines, markers and symbols for holding points and many other features may be added according to users' requirements. Markers may be made to track moving echoes, the resulting vector information being passed to other user-systems. The central mark is employed during its normal resting time to make such traces; and time-sharing techniques make it possible to produce numerous different symbols in succession.

Decca claim that the most important features of D.A.S.R.1 are good, gap-free coverage of small and large targets at long ranges and in all weathers with a very high data rate.

BREVITIES

UNDER a new five-year agreement, B.O.A.C. will be responsible for management and operation of Kuwait Airways. The longer regional services will be flown by Viscounts—aircraft will be chartered initially from Central African Airways—while those to Basra and Abadan will be operated with DC-3s.

* * *

The I.C.A.O. assembly has voted a net budget for 1959 of $3.7m (Canadian). This year's budget stands at $3.3m.

* * *

A fleet of four L.049s are being offered for sale by Delta. Travelair, Ltd., have been appointed sales agents for Europe.

* * *

The I.A.T.A. Clearing House reports a 25 per cent increase in the value of the first quarter's business this year over that of 1957. Offsets were equivalent to 90 per cent of all transactions.

* * *

Mr. W. I. Scott-Hill has been appointed B.E.A. general manager (traffic). His previous position as traffic manager is to be filled by Mr. R. G. Gibbons, former assistant traffic manager.

* * *

The Lebanese Government has approved an agreement between Air Liban, M.E.A. and L.I.A., covering allocation of routes until December 1960.

* * *

The recent unrest in Ceylon has led to the suspension of many internal air services. Following the destruction of Kankasenturai airport by rioters, all flights between Colombo and Jaffna have been cancelled.

Inlet Airways, a small Alaskan non-scheduled carrier, have taken delivery of an Alouette II helicopter.

* * *

Fairchild's first F-27 will be delivered to West Coast Airlines on June 22, at the company's Hagerstown factory.

* * *

The Giovanni Agusta A-Z-8 (four Alvis Leonides engines) made a successful first flight on June 9. It was airborne for 45 min.

* * *

Mr. Seijiro Yanagida, president of Japan Air Lines, and Mr. Ryohei Itow and Mr. Hoshito Kojima, joint managing directors, were given a special demonstration of the Fairey Rotodyne at White Waltham on June 9.

* * *

The Air Transport Advisory Council has recommended that B.E.A. flight frequencies between London and Manchester be increased rather than Eagle Aviation be awarded a licence to operate this route.

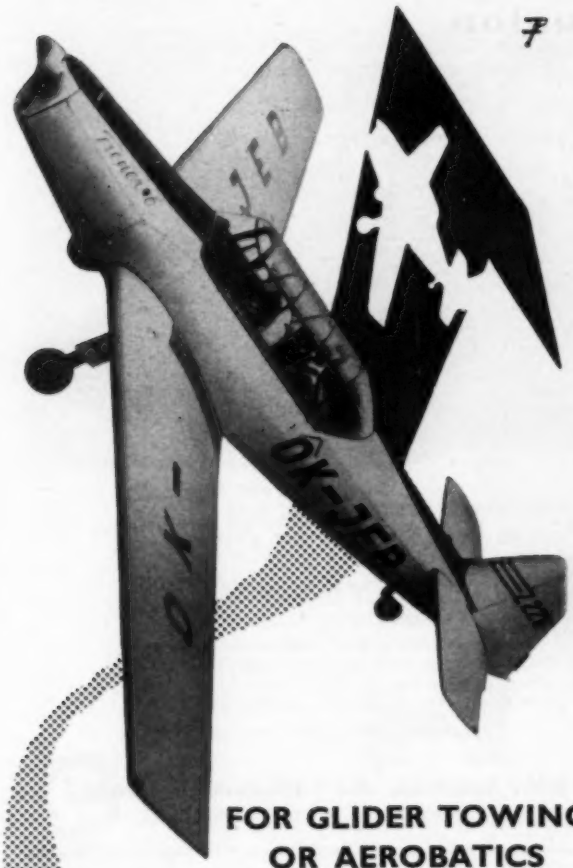
* * *

National Outdoor Advertising Awards for 1957 include two airline advertisements. In Class D (bulletin boards) second and third places were awarded for displays depicting the services of B.O.A.C. and PanAm respectively.

* * *

An L.749, one of three recently acquired by Aeronaves de Mexico from Air India, crashed shortly after take-off on a flight from Guadalajara to Mexico City on June 2. Among the 38 passengers and seven crew who died in the crash was Mr. Alfredo Gayou, vice-president of Aeronaves.

Now in service with New York Airways are five Vertol 44s equipped with pontoons. The helicopter illustrated is loading at the West Thirtieth Street heliport. Vertol 44s are also being operated by Sabena at the Brussels Fair.



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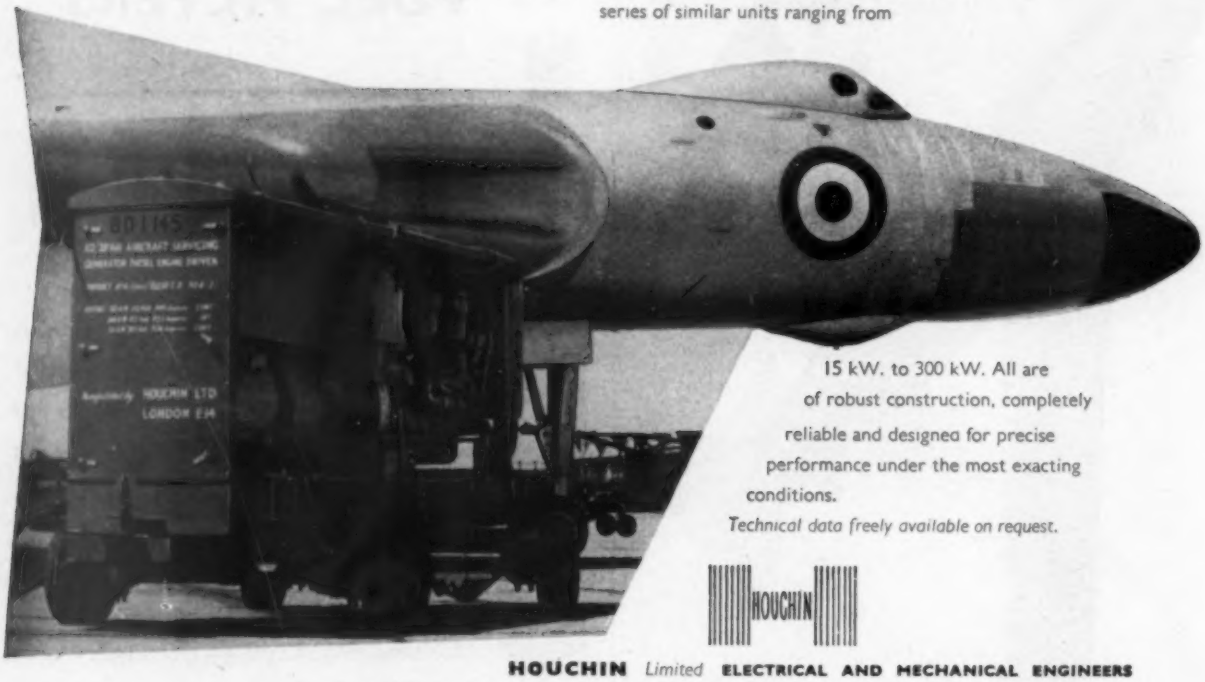

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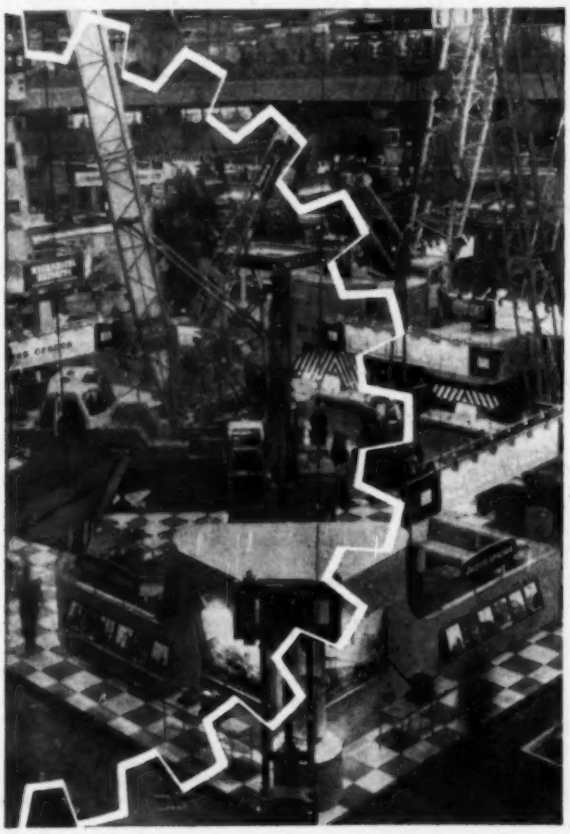

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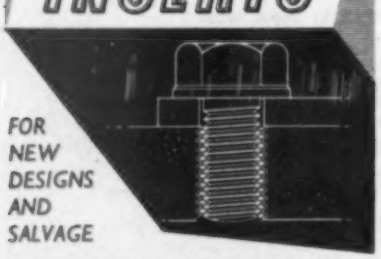

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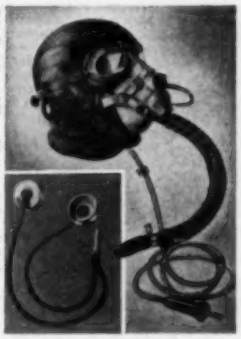

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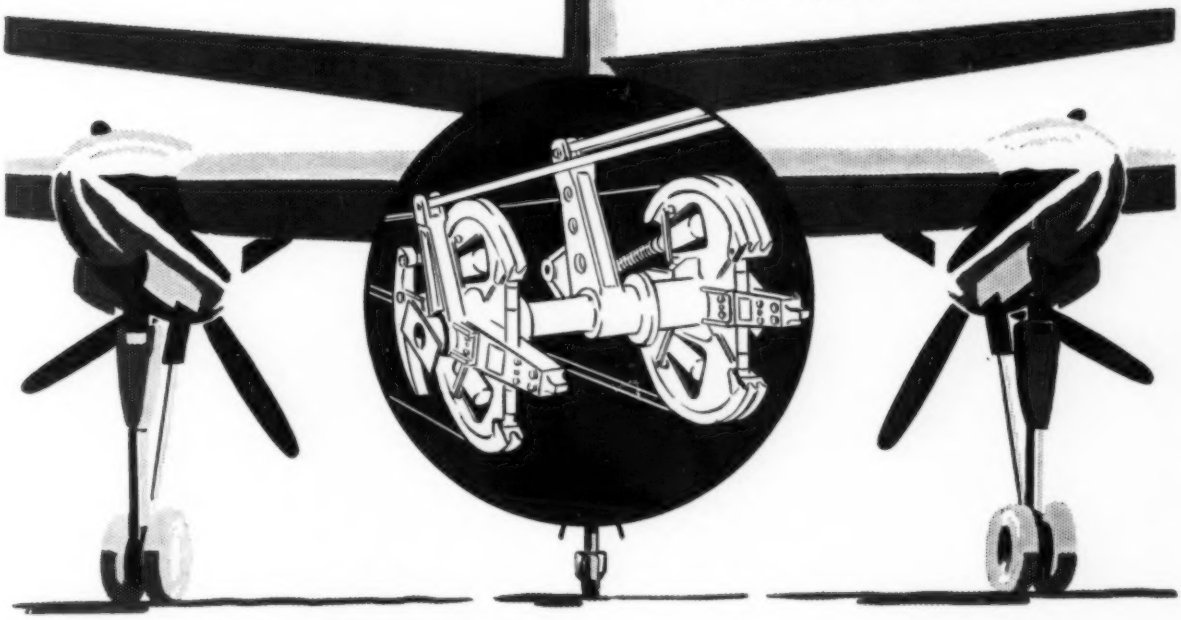

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